BBC wildlife

MARCH
2025
Issue 03 Vol 43

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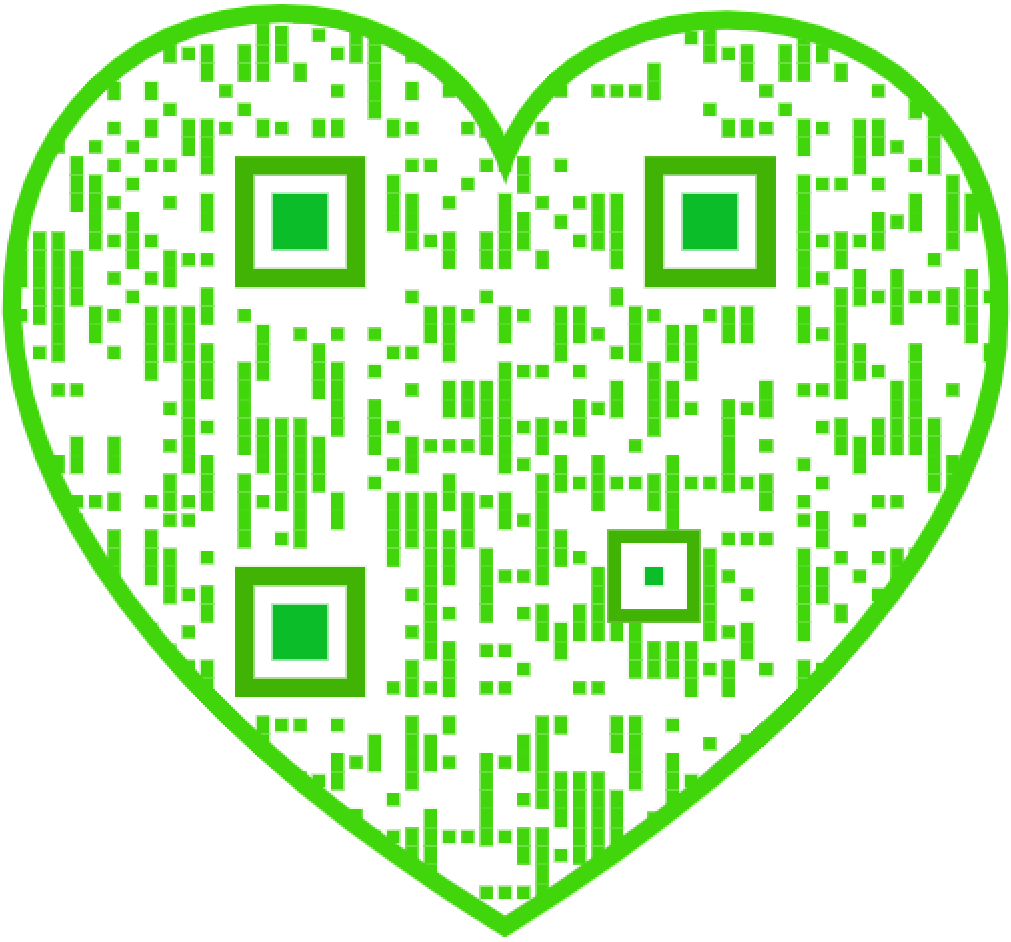
How penguins helped one photographer cope with grief

Plus

Elephant road trip
Sealions in Mexico
Conservation from space



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ELEPHANT ROAD TRIP: JIM TAN; PALLAS'S CAT: BBC STUDIOS; JOANNA PAGE: TWENTY SIX 03 ENTERTAINMENT LTD

Embarking on an elephant road trip

Conservation projects around the world can inspire us all

PAUL McGUINNESS, EDITOR

Have you ever tried to move an elephant from one country to another? No, me neither. How would you even go about it? Well, that's exactly what writer and photographer Jim Tan found out for us this issue as he followed a translocation project moving elephants from Namibia to Angola. And not just one elephant – lots of them.

His enlightening feature on page 50 really brought home to me some of the seemingly insurmountable logistics involved in conservation. It reminded me of the incredible lengths people go to in order to help the animals that share our planet.

Like so much else within these pages each month, Jim's piece gave me hope, and inspired me to think that anything can be done if enough of us want it to happen, no matter how mammoth a task it may seem. Enjoy the issue!

Paul

BBC wildlife

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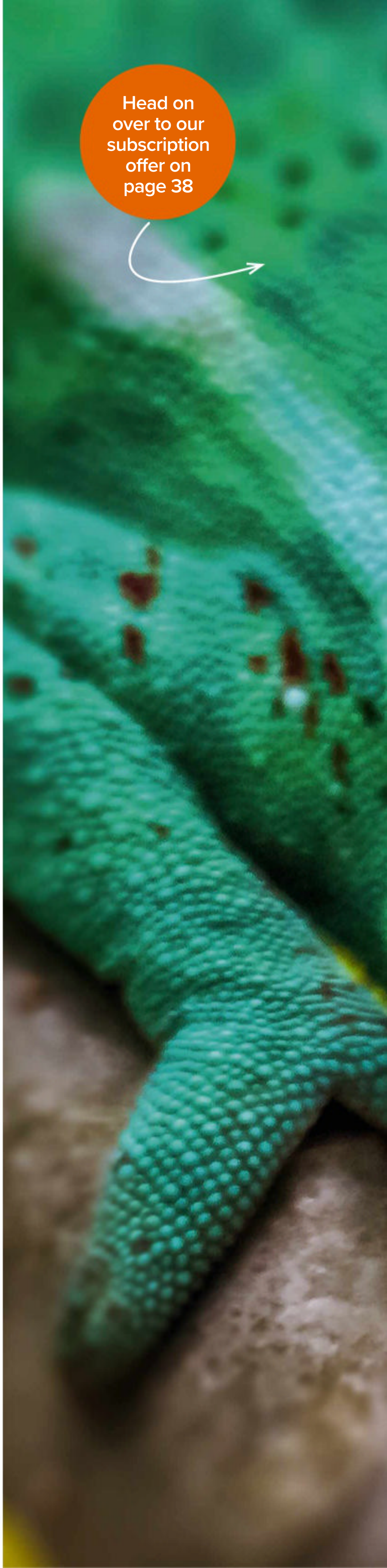

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PANTHER CHAMELEON: PIERIVB/GETTY

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MARCH
SOUTHERN COMFORT
How penguins helped one photographer cope with grief
Plus
Elephant road trip
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Conservation from space

THE COVER

Ursula Clare Franklin's photo of a king penguin among cabbage-dotted dunes was taken at Volunteer Point, Falkland Islands. She used a Nikon D500, focal length 100mm (Tamron 100-400 zoom lens), f13, 1/1250sec and ISO720.

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Take a dive with sealions

SEALIONS: HENLEY SPIERS; TURACO: KS KONG/GETTY; TOAD: ROLF NUSSBAUMER/NATUREPL.COM

Every month, only in *BBC Wildlife*

NICK BAKER
"It was the bug of my dreams, right in front of me, sat proudly atop a rotten tree trunk" ***P.36***

GILLIAN BURKE
"Life can exist without light, and in extreme temperatures. But it cannot exist without water" ***P.27***

MARK CARWARDINE
"We Europeans are incapable of living alongside predators" ***P.30***

LUCY COOKE
"Vampires use infrared sensors in their noses to detect the heat of blood pumping" ***P.29***

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"It would have been a familiar sight across the wetlands of the 14th and 15th centuries" ***P.32***

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The globe is awash with incredible animals in all colours of the rainbow

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Persian onagers are galloping back to Saudi Arabia, filling a niche left by an extinct relative
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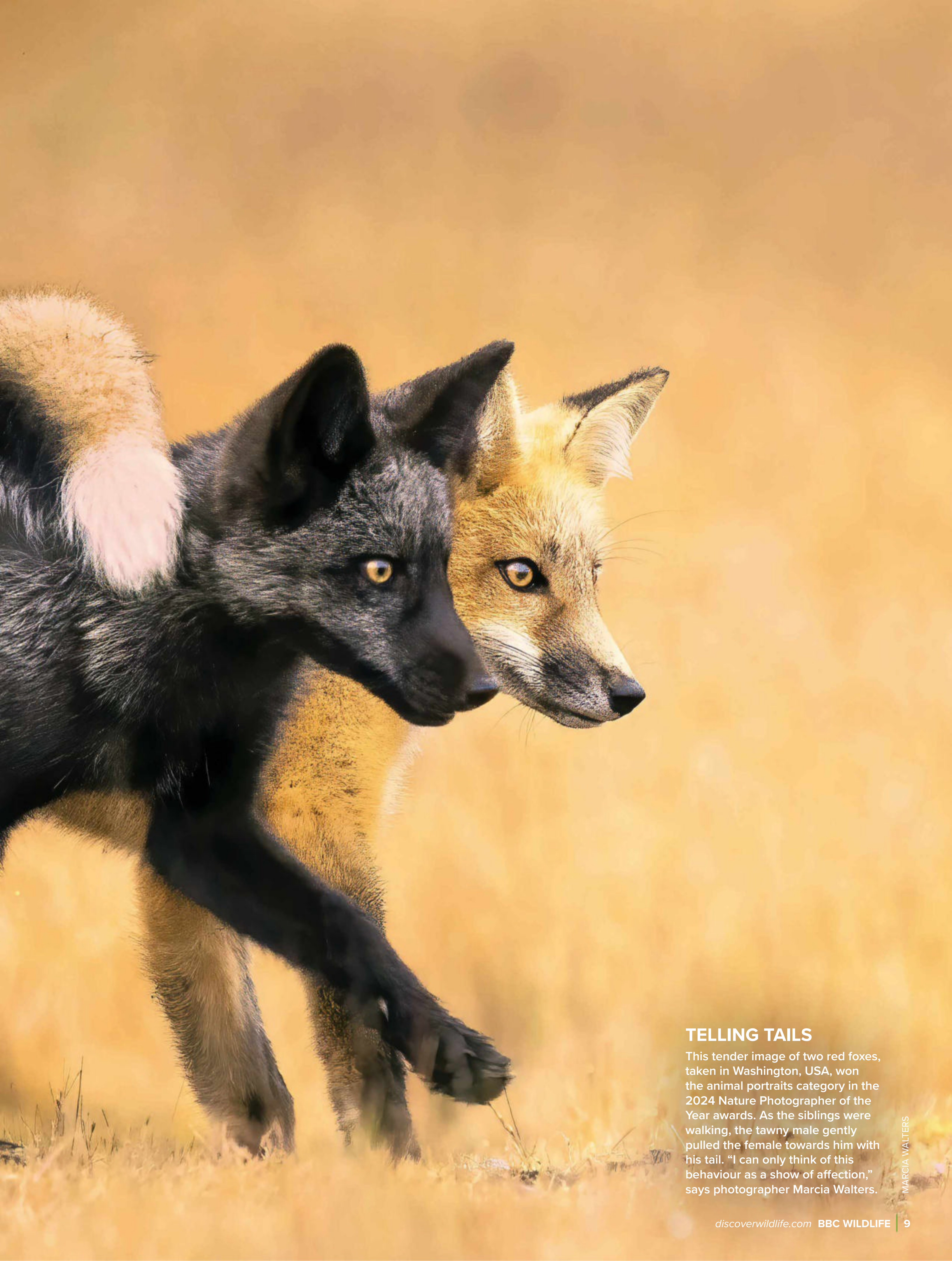
wild TIMES

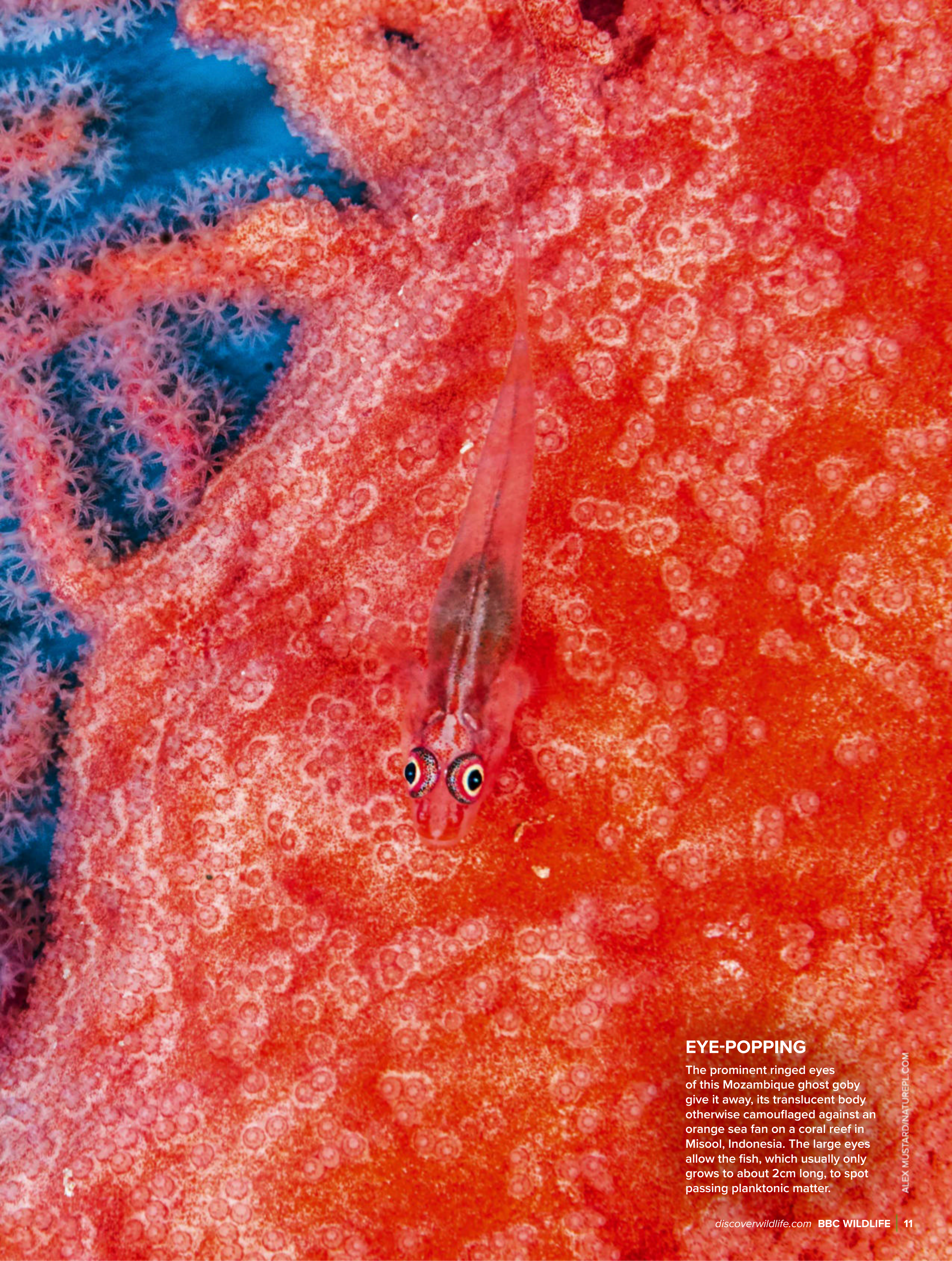
The latest news, photography and seasonal wildlife highlights



TELLING TAILS

This tender image of two red foxes, taken in Washington, USA, won the animal portraits category in the 2024 Nature Photographer of the Year awards. As the siblings were walking, the tawny male gently pulled the female towards him with his tail. “I can only think of this behaviour as a show of affection,” says photographer Marcia Walters.

MARCIA WALTERS



EYE-POPPING

The prominent ringed eyes of this Mozambique ghost goby give it away, its translucent body otherwise camouflaged against an orange sea fan on a coral reef in Misool, Indonesia. The large eyes allow the fish, which usually only grows to about 2cm long, to spot passing planktonic matter.

ALEX MUSTARD/NATUREPL.COM

Onagers gallop back to Saudi Arabia

Rare subspecies fills the desert niche left by its extinct relative

NEARLY A CENTURY AGO, THE SYRIAN wild ass, one of six subspecies of onager and the only one found in Saudi Arabia, was declared extinct, a result of hunting, habitat loss and competition with livestock. Last year, the country welcomed back these equids with the introduction of the Persian onager, a fellow subspecies and the closest genetic relative of the Syrian wild ass. Seven individuals were translocated to the Prince Mohammed bin Salman Royal Reserve in north-west Saudi Arabia from the Shaumari Reserve in Jordan, with the aim of establishing a new founder population. The herd recently welcomed a foal, an encouraging sign that the animals are adapting.

The Prince Mohammed bin Salman Royal Reserve encompasses 15 distinct ecosystems across 24,500km, and is one of the most biodiverse protected areas in the Middle East. The onagers join 11 other species that have been reintroduced here since 2022, including 60 Arabian oryx, 14 Nubian ibex, 125 sand gazelles and 22 mountain gazelles, plus six bird species, including the griffon vulture and Pharaoh eagle owl.

Persian onagers are typically found in and around Central Asia, specifically northern Iran. They are themselves endangered, with fewer than 600 individuals remaining in the wild. They're known for their impressive speed, able to gallop at up to 70kmph.

"These are the first free-running onager seen in Saudi Arabia since the early 1900s," says Andrew Zaloumis, CEO of Prince Mohammed bin Salman Royal Reserve. "Their reintroduction represents a transformative step for conservation and a major landmark in the kingdom's biodiversity efforts." The venture, supported by Jordan's Royal Society for the Conservation of Nature, is part of the reserve's long-term rewilding plan. **Kirsten Henton**

The movements and grazing behaviour of Persian onagers will play a key role in the ecosystem

ONAGERS: DAVID CHANCELLOR

The new study reports that in better protected areas, more cubs survive to adulthood

Protect the prey and the lions will roar

Study proves that lions thrive when snaring is reduced

A new study by the Zambian Carnivore Programme and partners has revealed the extent to which wildlife protection measures, such as anti-poaching patrols, can benefit lion populations. Depletion of prey such as antelope due to wire snares used for bushmeat hunting is one of the biggest threats to large carnivores across Africa, but prior to the research, surprisingly little was known about how this activity impacts lion populations, nor how effective intervention could be.

Conducted between 2013 and 2021 in Zambia's Greater Kafue National Park, home to the country's second-largest lion population, the study found that a lack of prey was causing mothers to roam further afield in search of food, leading not only to a low survival rate of cubs but, in some cases, the inability to breed altogether. Protection measures were introduced in 2018, mid-way through the study, with some areas afforded higher levels of protection than others. In the high-protection zones, researchers saw a 29 per cent increase in lion reproduction and an 8.3 per cent increase in the annual survival rate.

Lions, which are listed as Vulnerable by the IUCN and whose numbers have declined by 70 per cent over the past 50 years, also face threats of habitat loss, conflict with humans and livestock, and the illegal trafficking of skins and parts. The study concludes that "combining improved protection with improved programs for community conservation and coexistence should substantially improve the prospects for lion conservation". **Kirsten Henton**

Gannets follow a dolphin superpod

Airborne lifts off on Sky Nature

Across the planet, animals have conquered the skies in ways we can only dream of. *Airborne*, a new, four-part series for Sky Nature, made by Humble Bee films and narrated by Keeley Hawes, offers a colourful and exciting new perspective on the incredible creatures – both with and without wings – that have learned to defy gravity to travel, feed and breed.

Sequences to watch out for include condors battling Patagonia's strong winds while learning to soar in the foothills of the Andes – and fending off a surprise attack from a black-chested buzzard eagle; Cape gannets on Bird Island, in the remote reaches of the Indian Ocean, which have learned to follow dolphin superpods to feeding grounds; and a habituated goshawk in the Forest of Dean, whose breakneck speed and complex flightpath through the trees is captured using a purpose-built drone.

"Many animals have evolved to take to the air, and use their aerial agility to survive and thrive in ways that are often truly extraordinary," says executive producer Stephen Dunleavy. "The ambition for this series was to give a feel for what it must be like to have that freedom of movement, and to immerse the viewer in the world of airborne creatures." **Sarah McPherson**

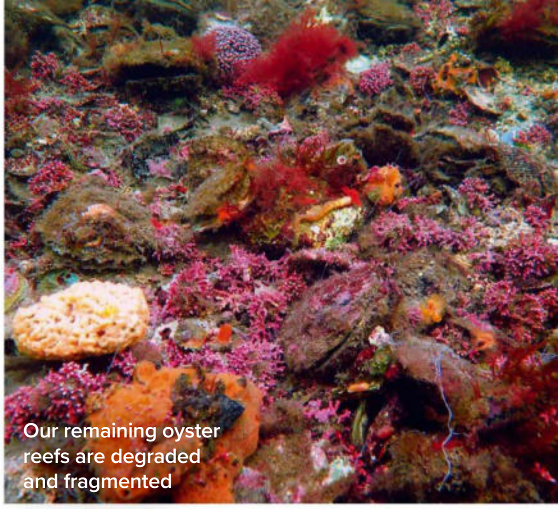
LIONS: ANNA KUSLER/ZCP; GANNETS: HUMBLE BEE FILMS

wild TIMES

This striking snake is found in the Cardamom Mountains, which range from south-west Cambodia into eastern Thailand

ECOLOGICAL SANCTUARY

A recent biodiversity survey by Fauna & Flora in Cambodia's rugged Cardamom Mountains has revealed an extraordinary array of invertebrates, reptiles, birds, amphibians and mammals, highlighting the ecological significance of the area. The species recorded include the spectacular Cardamom green pit-viper, Sunda pangolin, Asian elephant and dhole – a type of wild dog.



Our remaining oyster reefs are degraded and fragmented

Oyster reefs in ruins

Vital habitat is all but lost from Europe's seas

Researchers have revealed that Europe's native oyster reefs – the continent's equivalent of tropical coral reefs – are now classifed as Collapsed on the IUCN's Red List of Ecosystems.

The European native oyster (*Ostrea edulis*), also known as the European flat oyster, is the only true oyster species native to UK waters. According to the assessment, led by the Zoological Society of London (ZSL) and the University of Edinburgh, and published in the journal *Conservation Letters*, oyster reefs were once bustling habitats that together covered more than 1.7 million hectares – an area larger than Greater London. Today, however, due to overfishing, pollution and other human activity, there is almost nothing left of these ecosystems. Most oyster reefs in Europe are now scattered and degraded, with oysters found alone or in small clusters.

Oysters play a vital role in keeping the ocean healthy. As the crustaceans settle on top of one another, they create nooks and crannies in which other animals can live, creating thriving ecosystems full of fish, crabs, shrimp and other marine creatures. In addition, as filter-feeders, they keep the water clean by sieving tiny particles to eat – one adult can filter up to 200 litres of water each day. Oysters also provide livelihoods for local communities and protect the coastline from strong waves and storms.

"This ecosystem has been lost from living memory, and the benefits it provided have only just been realised," says the ZSL's Alison Debney. While restoration projects aren't a quick fix, since oyster reefs take a long time to regenerate, Debney has hope – as long as significant steps are taken to restore oyster beds. "Given time and space, nature can recover," she says. **Melissa Hobson**

GREEN PIT-VIPER: JEREMY HOLDEN/FAUNA & FLORA; OYSTERS: JOSÉ M FARIÑAS-FRANCO

Front lines for nature

Inside the ambitious UK project rallying local communities to fight for wildlife

It's just after 11am on the Normanton Road in Derby. A man is striding across a parking lot, shouting at no one in particular, his words lost amid the urban hum of a weekday morning. Adam Slater, community organiser for Derbyshire Wildlife Trust, smiles as if he's heard it all before.

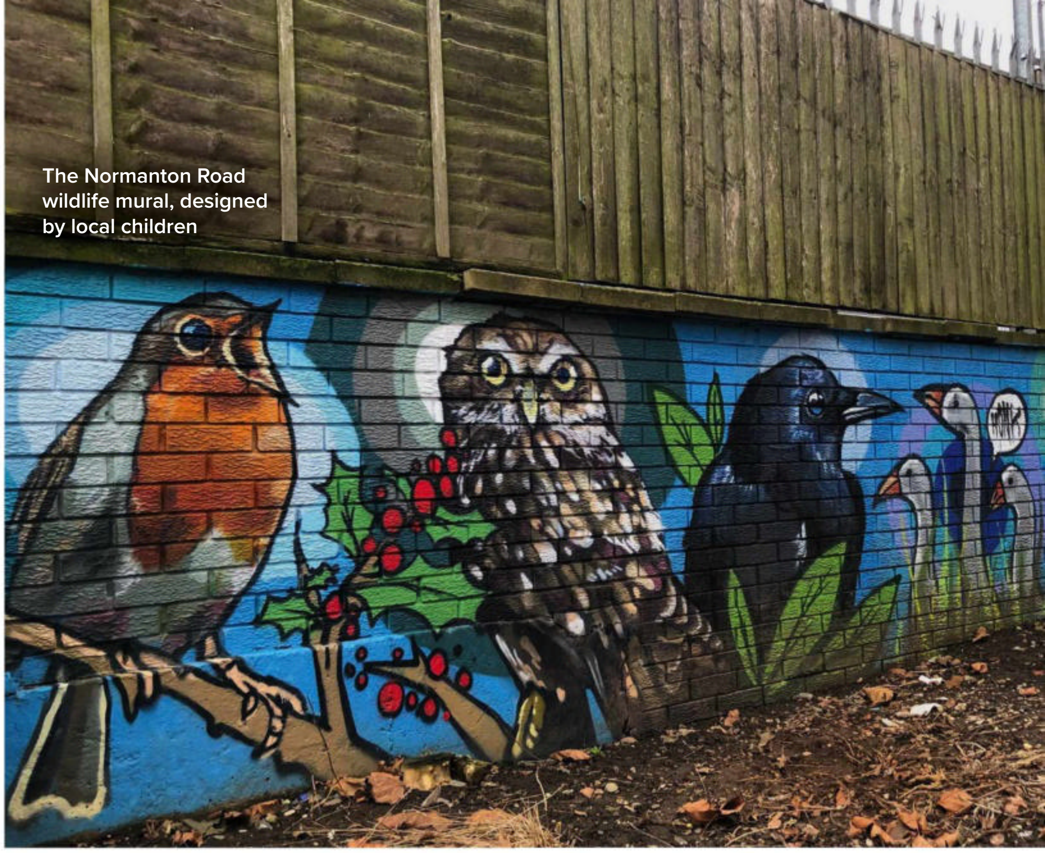
"You've got these two parks – Arboretum Park and Normanton Park – and there were all these little pockets of green space in between that were often abused with fly-tipping and anti-social behaviour," he says. "It was sad, because this area doesn't have a lot of green space."

> "People from ethnic minority backgrounds have on average 11 times less access to green spaces"

As part of The Wildlife Trusts' Nextdoor Nature project, which ran from 2022-2024 and aimed to reach people and communities that are largely excluded from "making decisions about nature", Adam was tasked with trying to connect local people to the city's wildlife.

This is not a tale of the miraculous conversion of a degraded habitat to one suddenly teeming with life. Instead, it

Pupils from Dale Primary School create a bug hotel in Normanton Park



The Normanton Road wildlife mural, designed by local children

“One of the biggest barriers to nature's recovery is the exclusive network of people involved in saving it”

recounts the first steps of a community’s engagement with nature. The gains may not sound much compared to the global conservation success stories usually described in these pages, but in many ways, they are equally significant.

This part of Derby is poor, with a transient population of refugees and a very high percentage of people with ethnic minority backgrounds, mainly India and Pakistan. Studies have shown that children of a black or Asian background are half as likely to visit the countryside as white children, and that people from ethnic minority backgrounds have on average 11 times less access to green spaces. Poverty, language barriers, lack of transport and cultural issues are identified as the key reasons behind this exclusion.

According to Nikki Williams, director of campaigns and communities for The Wildlife Trusts, involving people from ethnic minority backgrounds was a vital part of Nextdoor Nature. “We recognise that one of the biggest barriers to nature’s recovery is the exclusive network of people who are involved in saving it,” she says. White, usually middle-class people may feel like gatekeepers to marginalised groups, acting as a barrier to their involvement in wildlife restoration.

The idea in Derby was to create a kind of green corridor connecting the two parks, allowing communities along the way to make their own decisions about how this could be achieved. From the car park, the route runs south along the Normanton Road, past mini markets and mobile phone repair shops until it reaches an area of terraced planters that, according to Slater, had become a honeypot for anti-social behaviour.

Slater involved children from the local Pakistan Community Centre, who drew designs for murals that were then painted by local artist Todd Jerm – images of common birds and mammals. The result is a colourful array of street art that brightens up the area. “I felt this was a way of bringing nature into people’s lives,” says Adam. “Many times I’ve been here, I’ve heard kids walk past and name the animals they can see.” The area is no longer a hangout for day-drinkers and drug-users, and the designs aren’t spoiled by graffiti. By involving local people, there is greater pride in what’s been achieved.

SOCIETY PLACE IS THE NEXT PORT OF call, a small walkway between two streets that was once a local dumping ground. “Every time you came here, there’d be mattresses, sofas and piles of bin bags,” says Slater. There were day-drinkers here, too, which was intimidating to the children being dropped off at the nursery opposite.

Slater spoke to teachers at nearby Arboretum Primary School, and its children were asked to come up with designs for a facelift. He used the best ones as a blueprint for a small wildlife garden, including fruit trees and herbs, all good for attracting insects in spring and summer.

But the real benefit is the ongoing transformation. “The kids come back a couple of times a term to tend to the garden,” says Slater. “This is a very popular walkway, and once you see kids with their little litter-pickers, you’re less likely to dump stuff.”

Sarah Dosunmu, the council’s neighbourhood manager, agrees. For one woman, she says, this small green oasis

CHILDREN BUILDING BUG HOTELS: LINDSAY PILKINGTON/WILDLIFE TRUSTS; MURAL: JAMES FAIR

Wildlife-friendly gardening has been a key part of Nextdoor Nature activities up and down the country

> **“Restoring even a small area is restorative, because families can see how nature improves their lives”**

is effectively her garden. “If it makes a difference to one person, that’s a win.”

The concept of engaging local communities with their wildlife might be rare here in the UK, but it’s common in other parts of the world, usually because there’s more of it, and because it has a greater impact on everyday life. Conservationists must find ways of reducing human-wildlife conflict, and the solution is often to show people the benefits wildlife can bring – ecosystem services, for example. In Britain, in contrast, ecosystem services are notable by their absence.

NEXT DOOR NATURE HAS BEEN transformational in this sense, shifting the focus from the UK’s large and remote nature reserves and instead empowering individuals and communities to take on ‘micro projects’ to enhance nature on their own doorsteps. As a result, many improvements have taken place up and down the country.

The final destination in Derby is Normanton Park, where a small corner with some large, stately London plane trees is being rewilded, this time with input from Dale Primary School. There’s a bug hotel in the centre of an area that had previously been mowed by the council during the summer, and is now being left to grow wild.

Lindsay Pilkington, who works at the school, says this was a special experience for the children. “They were running through the long grass and pointing out the butterflies,” she says. “They couldn’t go in this corner before because it was full of fly-tipping and overgrown with nettles.”

Restoring even a small area can be transformative, because families can see how nature improves their lives. “Often, you are talking about things that benefit other people, not them, but if you’re doing it just around the corner, they can see it,” says Pilkington. The mental health benefits are also important.

Nextdoor Nature has reached 1,600 communities (it had originally aimed to reach 200) that Wildlife Trusts across the the UK, as well as dependencies such as the Isle of Man, have never worked with before. Though funding for the project has come to an end, most of the trusts have found the funds to retain their community organisers.

Much like standard rewilding, the goal is the process, not the end result. In the case of Derby, it’s engaging communities and – arguably more importantly – children. “Nature needs to be at the heart of contemporary society,” says Nikki Williams. “By people building their own relationships with nature and seeing how it helps them feel better, they start to advocate for it.”

It’s a fact often repeated that the UK is one of the most nature-depleted countries in the world. If we want that to change, grand, landscape-scale habitat restoration schemes are important, but involving local urban communities in turning around the fortunes of wildlife in their own areas is vital, too. In Derby, flowers are starting to bloom.

ABOUT THE AUTHOR

James Fair is a wildlife journalist with a specialism in conservation and controversial issues. Read more at jamesfairwildlife.co.uk.

COMMUNITY GARDENING: PENNY DIXIE/WILDLIFE TRUSTS

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wild MARCH

7 nature encounters for the month ahead

WITH NATURALIST AND AUTHOR BEN HOARE

1

Red squirrels are largely found in Scotland and Ireland, with sparse populations in England

Out in the cold

RED SQUIRRELS DON'T hibernate, relying on their thicker winter coats and supplies of food hidden in autumn for survival. If the weather takes a turn for the worse, they might stay in their moss-lined drey all day, but otherwise remain active even when snow lies on the ground. This is also their breeding season, so you may hear their chirping mating calls and see males chasing potential partners through the trees.

2

Red alert

RED KITES WERE PRACTICALLY EXTINCT IN the British Isles by the early 1900s, with just a handful of pairs still breeding in remote Welsh valleys. Now these fabulous birds of prey are a great conservation success story and a common sight over swathes of England and Wales. It's hard to miss them along some stretches of the M4 and M40 motorways, or soaring over towns such as Reading and Henley.

Unlike most European raptors, red kites are actually quite social. Dozens of them gather when there's a good feeding opportunity, and in winter they roost communally. In his *BBC Wildlife* column in 2003, the great nature writer Richard Mabey described the "extraordinary spectacle" of seeing the sky full of kites.

"They were using their tails like rudders, sometimes spiralling round," he wrote. "They'd turn into the wind, raise their wings – as relaxed as a dancer's arms or a half-full jibsail – and gather the air in, fold it into themselves. It was so perfectly beautiful, so naturally muscular, that I couldn't help flexing my own shoulders, in sympathy."

A reintroduction programme saved the red kite from national extinction

3

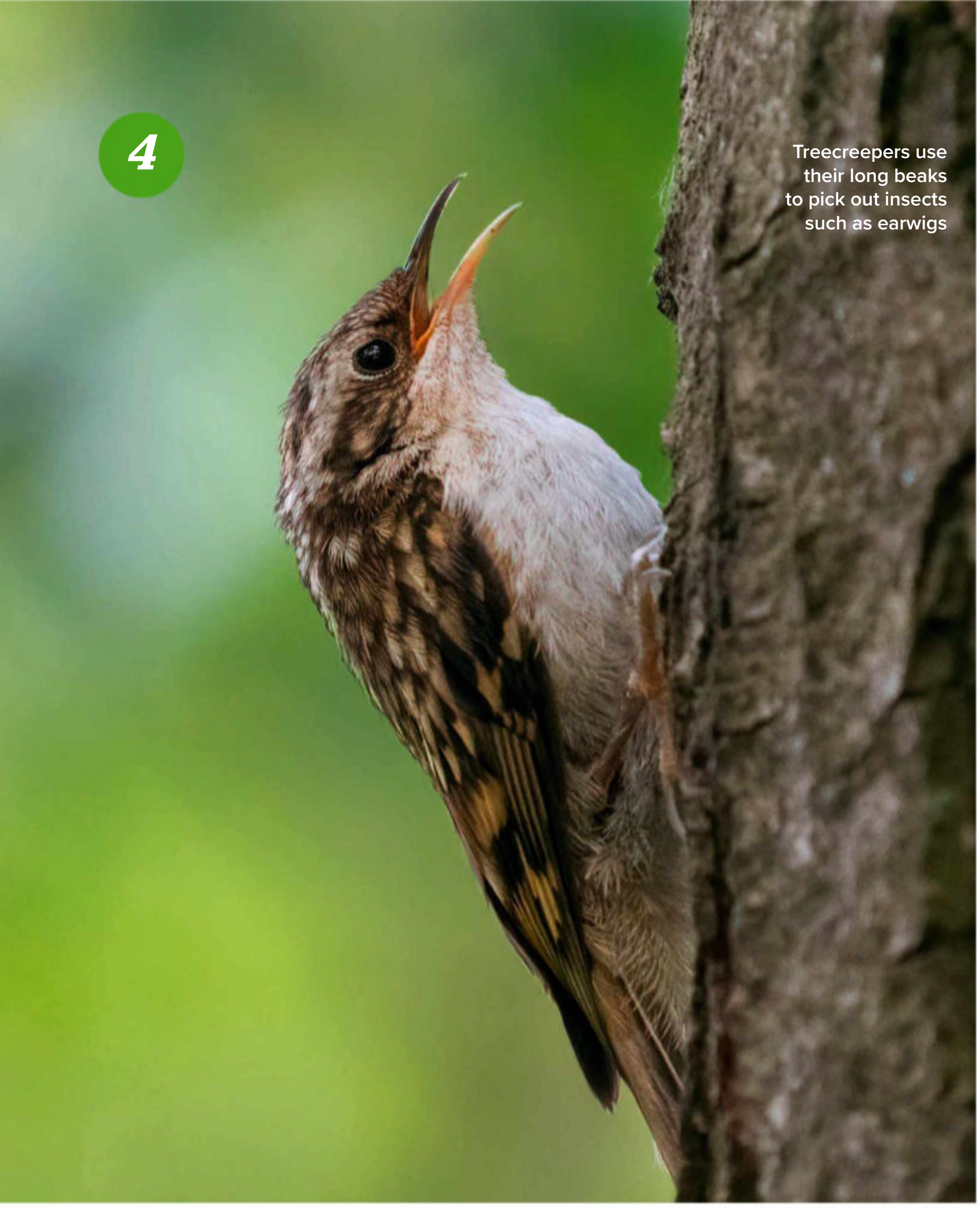
Honey trap

IF YOU SPEND TIME NEAR A SUNNY VERGE covered in primroses, you may well notice a fascinating insect called the bee-fly. There are actually a few species, with the dark-edged, or greater, bee-fly being most common in the UK. Perhaps the first thing you'll notice is the enormous proboscis that sticks way out in front of its face. Then you may be struck by how much its rotund, furry body looks like a bee. And, in fact, its wings buzz loudly like a bee too.

This is no coincidence because the bee-fly is an expert bee mimic. Its disguise enables it to approach the nest tunnels of various digging and mining bees, such as ashy mining bees, so it can flick its eggs inside. When its parasitic maggots hatch, they will suck the life out of the hapless bee grubs. Gruesome stuff. In the meantime, the adult bee-flies are entertaining to watch as they dart between primroses, lungwort and other spring-flowering plants with tube-shaped blooms. Their impressive proboscis is adapted to reach the nectar at the bottom.

Unlike bees, bee-flies don't sting and have one pair of wings

SQUIRREL: MARK HAMBLIN/NATUREPL.COM; RED KITE: GRAHAM EATON; BEE-FLY: PHIL SAVOIE/NATUREPL.COM



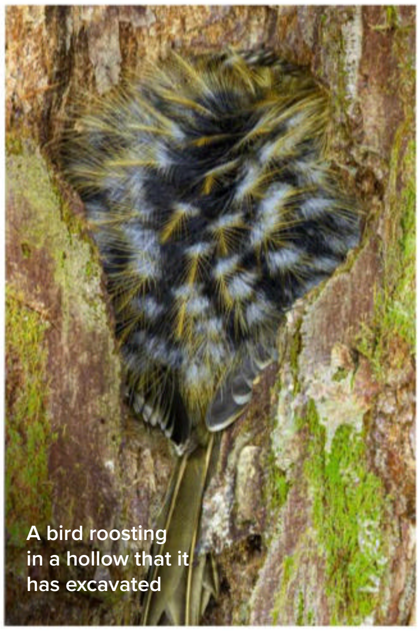
4

Treecreepers use their long beaks to pick out insects such as earwigs

Tucked up

Treecreepers are seldom seen away from tree trunks and branches, spending virtually their entire lives pressed to the bark. Their mottled upperparts blend beautifully with the rough surface. When night falls, they find pieces of loose bark to roost behind.

Since Victorian times, these hyperactive little birds have also learned to take advantage of the spongy bark of giant and coast redwoods planted in Britain's urban parks and the grounds of stately homes. The fibrous material – a protection against fire in the trees' native California – is soft enough for the treecreepers to excavate a sleeping hollow that fits them perfectly.



A bird roosting in a hollow that it has excavated

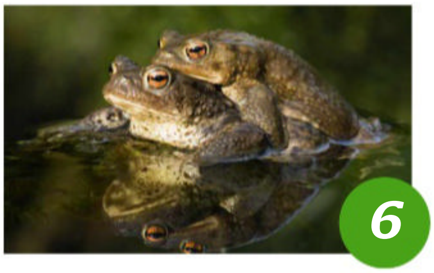
ABOUT THE AUTHOR

Ben Hoare is a wildlife writer, editor and all-round 'nature nerd'. He also writes highly acclaimed illustrated natural history books for children.

5

It's a wrap

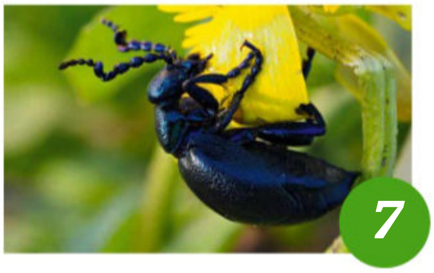
Butterbur is named after its huge leaves, once used to wrap butter. But before the leaves appear on Britain's riverbanks and ditch sides, this water-loving plant produces lots of pink flowers, whose plentiful nectar is welcomed by the year's first bees and other early insects.



6

Pond life

Common toads are roused from their winter slumber on mild and rainy evenings from late February to April, usually when the mercury hits 8°C. The egg-laden females waddle to their breeding ponds in the dark, followed eagerly by the smaller males who hope to fertilise them.



7

Beetling about

Though few British beetles are active in March, it's often a good time to spot black oil beetles. The flightless adults are weirdly proportioned, with a bulbous abdomen and thick, heavily jointed antennae. Now rare, they mainly live on grassy clifftops in the south.

TREECREEPER: ALEX COOPER/ALAMY; FEATHERS: ALEX HYDE/NATUREPL.COM; BUTTERBUR: ALEX HYDE/NATUREPL.COM;
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Life on Earth cannot exist without water

BBC iPLAYER

It’s not too late to catch up with BBC Two’s *Springwatch*

OPINION

GILLIAN BURKE

“Many of us have been disconnected from the miracle that is water”

“ISN’T IT IRONIC THAT, BY HAVING access to running water at the simple turn of a tap, many of us have been disconnected from the miracle that is water? Water is life. This is the rallying call of water protectors and environmental activists around the world. While it may sound like a load of overused hyperbole, perhaps it doesn’t go far enough in capturing the many ways that water is critical to life on Earth.

Life can exist without light in the darkest caves and under the weight of the deepest oceans. It can survive in sub-zero temperatures and even around the fiery heat of a hydrothermal vent. But the one thing life cannot exist without is water.

Water is the single most abundant chemical found in living things. Though there are some animal and plant groups, from tardigrades to ‘resurrection plants’, that can survive desiccation, even they must, at some point, rehydrate to function, grow and reproduce.

Water is the only substance to occur on our planet in all three physical states – as a solid, liquid and gas – but it is in its flowing, liquid form that it is essential to life. Acting as carrier and mediator for the chemistry of life, molecular properties peculiar to water allow life-bringing salts, sugars, proteins and vital gases to be dissolved and flow around the body, to reach every cell.

Water dissolves more substances than any other liquid but what it can’t dissolve is equally important, as anyone trying to mix oil and water will know. Hydrophobic molecules, like fatty acids and most lipids, do not dissolve in water and it is this property that allows them to form the vital cell membrane that defines the crucial boundary, just a few molecules thick, between the inner and outer world.

Even at a planetary scale, water continues to deliver the essentials for life. Energised by the sun, the water cycle distributes heat energy around the planet, showering down as mist, rain, hail and snow that fills river systems and drainage basins. The living world, from individual organisms to entire ecosystems, is in constant dialogue with this cycle.

Like a living sponge, healthy forest and peatland soils soak up this water. Their ability to absorb is maintained by root systems, burrowing animals and countless microbes, which work to build healthy soil with an open texture that allows water to seep into the earth. The water eventually percolates through rocks and aquifers where, after days, years or even thousands of years, it springs forth, filtered and mineralised, to feed life and land, and keep streams and rivers flowing.

But changes in land use, from industrial farming to urbanisation, have altered river courses and broken the cycle, amplifying the effect of heat-trapping greenhouse gases. A less absorbent landscape also means an increased risk of floods when it rains and more severe drought when it doesn’t.

The climate crisis is rightly framed through the lens of the carbon cycle but, with this narrow focus on a single metric, are we missing a more holistic trick? Kongjian Yu, a landscape architect and professor at Peking University, is working to create ‘sponge cities’ around the world that make use of green infrastructure such as parks and green roofs. In a now-viral video, he says we need to “learn to play tai chi with water,” deflecting where possible and yielding where necessary to water’s natural flow.

This is more than simply managing ecosystem services. It suggests we must heal our relationship with water to restore balance in a rapidly changing world.

Gillian Burke is a biologist, writer, film-maker, TV presenter and podcaster. She joined the BBC Two *Watches* team in 2017.

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FEMALE OF THE SPECIES

— VAMPIRE BATS —

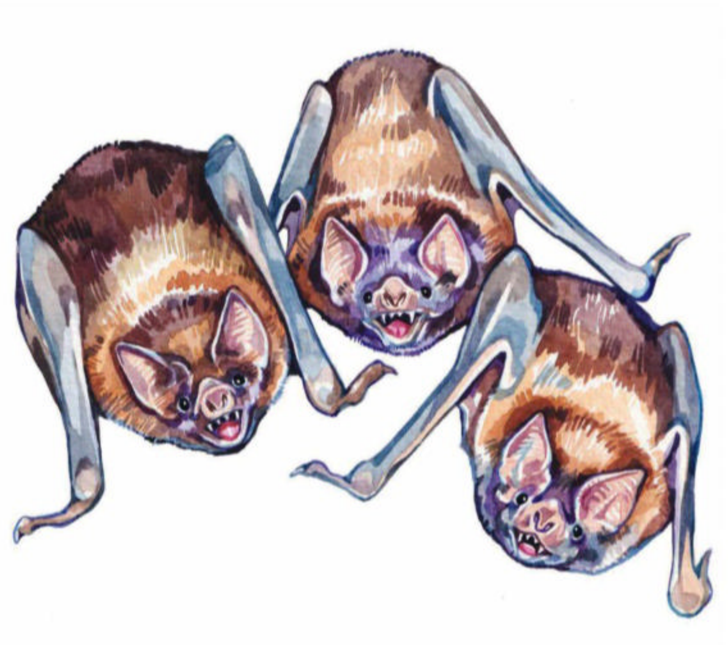
Vampire bats make for blood-spewing besties

Few species have been more misunderstood than the vampire bat (*Desmodus rotundus*). Slanderous falsities started with 16th-century New World explorers, who returned to Europe with lurid tales of bloodthirsty beasts that drained their troops as they slept. For a start, vampire bats don't suck blood, they lap it from an open wound. And being the size of a mouse means their liquid diet amounts to little more than a spoonful. They also rarely attack people – they tend to feed on domesticated cattle or chickens.

Vampire bats approach their victims by stalking them from the ground. They use their exaggerated, winged hands to drag themselves forward while bouncing on stunted rear legs. This sounds awkward, but they move surprisingly fast. One inspired scientist placed bats on a treadmill and they clocked a top speed of more than 2m per second. Vampire bats can also launch themselves vertically, like a Harrier jump jet.

Vampires use infrared sensors in their noses to detect the heat of blood pumping close to the skin (which therefore provides easy access). Favourite hotspots are fur and feather-free: think feet (ticklish), ears (annoying) and anuses (good lord). Bats will return to feed on the same spot several nights in a row, guided by their unique ability to listen out for and memorise a preferred victim's breathing patterns.

Bloodthirsty bum-biters that stalk their prey by listening to them breathe may sound more evil than Dracula himself. The truth is that female vampire bats are one of the animal kingdom's most magnanimous animals. Being a flying mammal is an energetically expensive existence, especially for pregnant or nursing mothers. The vampire bat's exclusively hematophagous diet provides far from ideal fuel, since blood consists of 80 per cent water and absolutely no fat. Vampire bats have specially adapted digestive systems that eliminate excess water by urinating as they feed, which enables maximum protein consumption without their stomachs exploding. But with no fat, and no opportunity to build up fat reserves, they must feed at least every 70 hours or die. Up to 30 per cent of bats fly home empty. Two consecutive nights of feeding failure means almost certain starvation.



Despite their somewhat sinister reputation, vampire bats form strong bonds and frequently share food with one another

One of the world's leading experts on bats, Professor Gerald Wilkinson, discovered how vampires evolved a food-sharing system that sees females vomit up congealed blood for their hungry neighbours. What's more, they regurgitate for roost-mates that are not even family members. In fact, they are more likely to share with blood-regurgitating buddies than their own relatives. In this caring, sharing, blood-spewing community, female bats form strong and meaningful bonds with each another. 'You can think of them almost as friends.' Wilkinson told me.

Vampire bats have an extraordinarily long lifespan for an animal of their size – 30 years compared to two or three years for a similar-sized mouse. They use that time to develop a wide circle of friendships. Bats placed in an enclosure with strangers don't start sharing food immediately. They test the water by huddling together first, then move on to grooming and finally start sharing food after about two years. Recent research suggests these bonds extend even beyond the roost. Tracked females demonstrated specialised calls while out foraging. These helped female vampires recognise their besties and invite them over for a life-saving meal: a level of social sophistication rarely seen outside of primates. The world might be a kinder place if humans were a bit more like vampires.

Lucy Cooke is a broadcaster, zoologist and author of *Bitch: What Does It Mean to Be Female?* The Penguin paperback is on sale now.

BBC SOUNDS

Catch up with Lucy's three-part BBC Radio Four series, *Political Animals*

ILLUSTRATION BY HOLLY EXLEY

BROWN BEAR: IMAGEBROKER/MCPHOTO/HELMUT & EVA PUM/ALAMY

A brown bear climbs a tree in Sweden, where numbers are plummeting

OPINION

"Europe seems hellbent on creating the most hostile environment for bears possible"

MARK CARWARDINE

WE EUROPEANS ARE INCAPABLE of living alongside predators. We blithely expect people in Africa and Asia to share their homes with lions, tigers, Komodo dragons and a host of other potentially dangerous animals without question. So why can't we be as sympathetic and enlightened about predator conservation as they are?

The latest guilty party is Sweden – which has unleashed another season of hunting hell on its brown bears (*see box*). Sweden's bears were hunted almost to extinction and, by 1930, there were just 130 of them left. Conservation efforts pushed numbers up to a peak of 3,300 in 2008, but then the authorities decided that bear numbers had to be reduced "to prevent conflict with people and their domestic animals". Now there are 2,450, and Swedish conservation groups believe the aim is to reduce the population to just 1,400.

> "Over the last century, only two people have been killed by bears in Sweden, both in relation to hunting"

Is there a bear problem in Sweden? No, there is not. In 2022, 11 sheep were killed by bears, while 220,000 were killed by humans for food. Meanwhile, over the last century, only two people have been killed by bears, both in connection with hunting.

Wolves are in the crosshairs, too. Following reintroductions and careful protection, there are now 21,500 of these awesome animals across the continent. But as numbers increase, there is a rising tide of hostility. Even Switzerland is in the throes of a cull designed to kill 70 per cent of its wolf population (currently 300 animals in 32 packs). This is despite the fact that predation on livestock has plummeted while wolf numbers have increased. The Norwegian government, meanwhile, seems determined to limit its wolf population to just a few breeding pairs – which it says is enough to keep them from extinction. More accurately, it will push them to the verge of extinction.

There's no denying that wolves occasionally predate livestock. But there are tried-and-tested ways of reducing the problem: boosting the availability of natural prey, electric fencing and the use of guard dogs among them. Many countries even have 'wolf commissioners', who help farmers to protect their stock, and there is generous compensation for any predation. They're not dangerous to people, either. According to the European Commission's own 2023 investigative report on wolf attacks, "although wolves can attack humans, no fatal wolf attacks on people have been recorded in the past 40 years". Ironically, more people are killed by livestock (cows alone kill about four to five people per year in the UK).

The hunts seem to be politically motivated, under pressure from powerful farming and hunting lobbies. Europe seems hellbent on creating the most hostile environment for bears and wolves possible. We're just as bad in the UK. The mere mention of bringing back wolves is consistently met with howls of protest.

Now we're on the hunt for white-tailed sea eagles, which farmers in Scotland blame for killing lambs. They were extinct in the wild a century ago but, thanks to reintroductions, there are now an estimated 150 breeding pairs. Some farmers claim losses of more than 200 lambs in a single season. But the evidence is thin. Despite hundreds of hours of field studies, no one has ever seen a sea eagle attack a healthy lamb. A study published in 2023 revealed that lamb accounted for just 6 per cent of more than 11,000 bits of food found in sea eagle nests (and most of that is presumed to have been scavenged). Lambs die inexplicably all the time – thanks to the vagaries of the weather and fluctuating flock health – so it seems the eagles are being used as scapegoats.

There is a bigger picture here. Predators earn their keep through wildlife tourism (according to the RSPB, even the sea eagles earn millions of pounds for the local economy) and they are keystone species vital in maintaining the health and balance of ecosystems. It's not all about farmers and hunters. There has to be a compromise.

AT A GLANCE

- In 2024, the Swedish government issued 486 licences to shoot brown bears – about 20 per cent of the country's remaining brown bear population.
- A further 50-100 bears can be expected to be killed by so-called 'protective hunting' (when they are deemed a threat to life, livestock or property).
- In theory, Europe's 17,000 remaining brown bears are strictly protected. But Sweden is far from alone. Romania's MPs voted in July 2024 to double its hunting quota from 220 brown bears to 481, and several other European countries sell bear hunting licences to foreigners.
- In December, the status of wolves in Europe was downgraded from 'strictly protected' to 'protected', allowing farmers to kill wolves deemed a threat to livestock.

Want to comment?
Share your thoughts on Mark's column by sending an email to wildlifeletters@ourmedia.co.uk

Mike Dilger's
WILDLIFE SPECTACLES

The broadcaster, naturalist and tour guide shares the most breathtaking seasonal events in the world

THE CALLING

COMMON CRANE COURTSHIP

As winter rolls into spring, Britain's tallest bird sings and dances through our wetlands once again

For those who care about the natural world, it can be depressing hearing the seemingly endless stories about habitat destruction and species extinctions. But the conservation movement is winning a few battles, one of which is the re-establishment of a breeding population of common cranes in Britain after an absence stretching back to Elizabethan times.

Globally, the common crane lives up to its name, with a population comprising around half a million birds. They breed from northern Europe across to eastern Siberia, with the majority coupling up in remote moorlands, bogs and swampy clearings across countries such as Russia, Finland, Sweden and Poland.

Britain marks the edge of the species' natural range, so it's perhaps hard to imagine that its famous courtship dance and bugling call would have been a familiar sight and sound across the wetlands and fenlands of the 14th and 15th centuries. In fact, cranes were once so common that it's said 204 were roasted at a celebration for the Archbishop of York's enthronement in 1465. Such overzealous hunting, plus the draining of their marshland home, eventually led to their extinction as breeding birds by 1600.

But then, in autumn 1979, a continental migrating pair was blown off course to

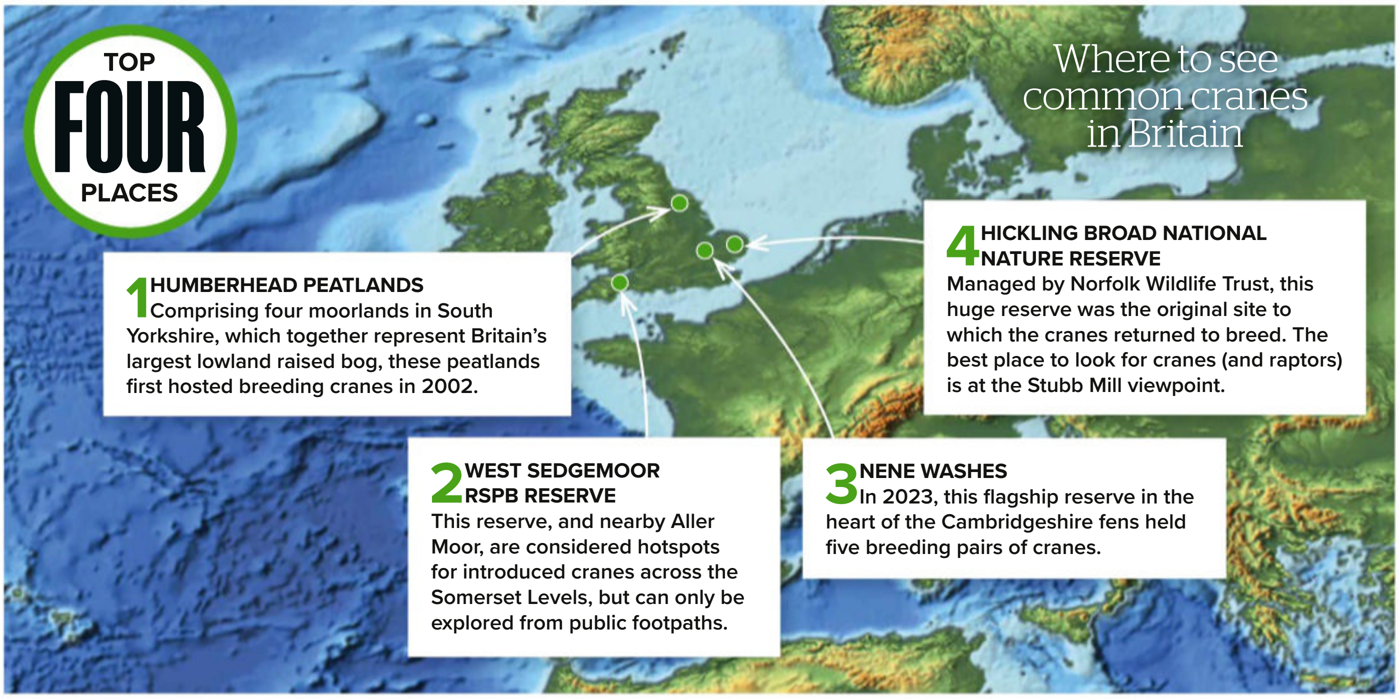
Did you know?

The common crane is an extremely vocal species, known for its distinctive, trumpet-like call. The birds use a range of sounds to communicate and to coordinate movement while in the air.

At around 120cm in height, Britain's tallest bird cuts a graceful figure

CALLING CRANES: MIKE POWLES/GETTY; CRANE IN GRASSLAND: NICK UPTON/NATUREPL.COM

A male and female crane, here in Norfolk, call to re-establish their pair-bond



Where to see common cranes in Britain

1 HUMBERHEAD PEATLANDS
Comprising four moorlands in South Yorkshire, which together represent Britain's largest lowland raised bog, these peatlands first hosted breeding cranes in 2002.

2 WEST SEDGEMOOR RSPB RESERVE
This reserve, and nearby Aller Moor, are considered hotspots for introduced cranes across the Somerset Levels, but can only be explored from public footpaths.

3 NENE WASHES
In 2023, this flagship reserve in the heart of the Cambridgeshire fens held five breeding pairs of cranes.

4 HICKLING BROAD NATIONAL NATURE RESERVE
Managed by Norfolk Wildlife Trust, this huge reserve was the original site to which the cranes returned to breed. The best place to look for cranes (and raptors) is at the Stubb Mill viewpoint.

the Norfolk Broads. They decided to stay, rearing a single chick a couple of years later. This natural recolonisation, boosted by reintroductions, has seen the trajectory move upwards ever since, with the British population now estimated to be more than 250 birds.

At around 120cm in height, Britain's tallest bird cuts a graceful figure. Long legs and a slender, black-and-white neck are topped off with a red-brown patch, contrasting with a dove-grey body and predominantly black bustle of curved feathers that droops over the rear end. The huge size is most obvious in flight, when straight, broad and fingered wings give the appearance of a plank crossed with a pool-cue.

> "In flight, broad wings give the appearance of a plank crossed with a snooker cue"

Unlike continental cranes, which migrate to northern European breeding grounds in spring, British cranes appear largely sedentary, remaining in the country. Winter is often spent in flocks at a few favoured locations, then, as the season draws to an end, these monogamous birds initiate a reaffirmation of their bonds as they prepare to breed.

The partners run through an elaborate repertoire of displays, which include bowing, head bobbing, arching their necks and bills, and leaping upwards while showing off their 2m-plus wingspans. All, or segments of, this routine will be accompanied by a clanging, trumpet-like call, which can travel distances of up to 6km.

Displaying ramps up once the cranes disperse to their breeding grounds in February and March. In Britain, they favour wetland sites with emergent vegetation in shallow water, with pairs protective over their patch. A clutch of two eggs is laid between mid-March and early May, after which the birds become more social. In large gatherings it is surprisingly difficult to pick out any one individual.

In winter, cranes mostly feed on vegetable matter, such as seeds, grass shoots, berries and crop leaves. As their young hatch, they switch to a protein-rich invertebrate diet, taking small mammals and birds when the opportunity arises. Keen to avoid hungry foxes, the young soon accompany their parents on foraging missions, fledging nine to ten weeks later.

Most crane-breeding locations are on sites already protected by conservation organisations, making the future of this iconic species more assured. Let's hope things stay that way, because, to wilfully misquote Oscar Wilde, "To lose cranes once may be regarded as misfortune; to lose them twice looks like carelessness."

Surveys revealed that 36 common crane chicks fledged successfully in 2023

LOOK CLOSER

Crane names

The common crane's history in Britain has been immortalised in a number of place names. Tranmere, for example, comes from the Viking for 'crane-marsh', while the origins of Cranmoor and Cranbrook are a little more obvious.

The Great Crane Project

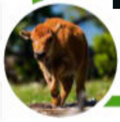
In 2010, a project began with the aim of returning cranes to the Somerset Levels and moors. Over five years, 94 chicks were hatched, hand-reared and released, with the first successful breeding in 2015. The population has steadily increased since and the birds are starting to spread.

Teddy bear's picnic

While in crane-friendly habitat across East Anglia and the Cambridgeshire fens, keep a lookout for Chinese water deer. Resembling teddy bears with tusks, these small deer were introduced here in the 19th century. Despite being endangered back in China, the population in the UK is estimated at 3,600 and increasing.

Chinese water deer

NEXT MONTH



It's breeding season for bison, the USA's national mammal

CHICK: ANN & STEVE TOON/NATUREPL.COM; CHINESE WATER DEER: ROBIN CHITTENDEN/NATUREPL.COM; BISON: LEILA COKER/ALAMY

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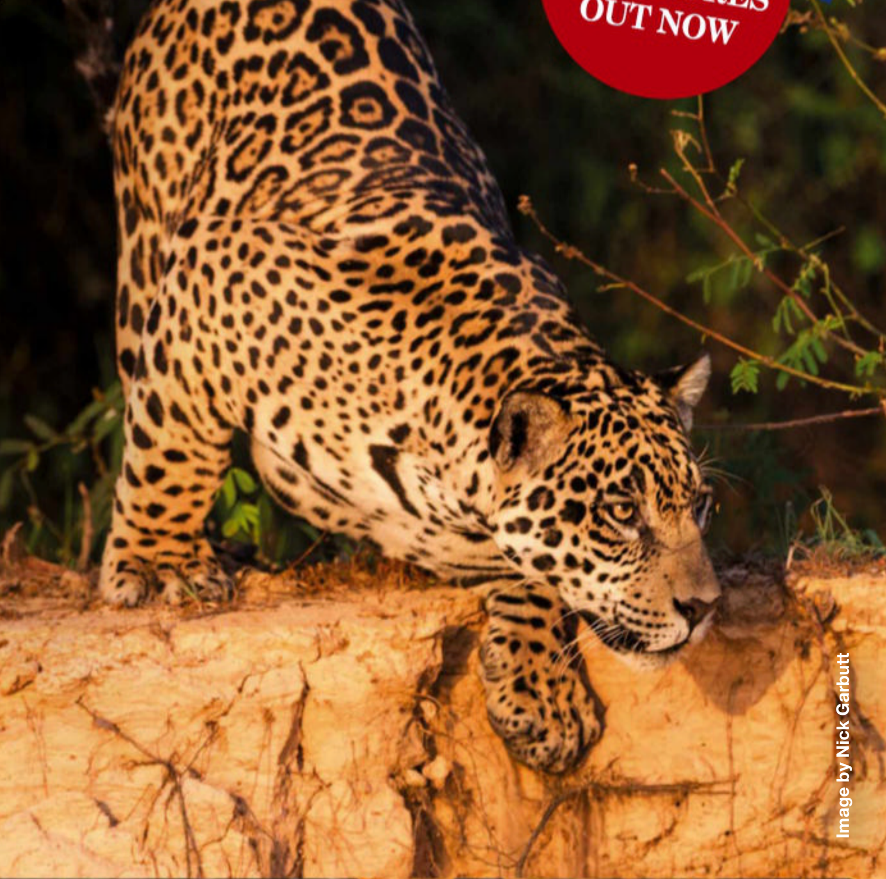
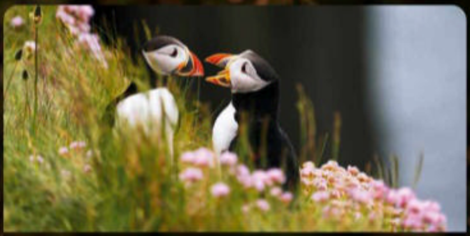


Image by Nick Garbutt



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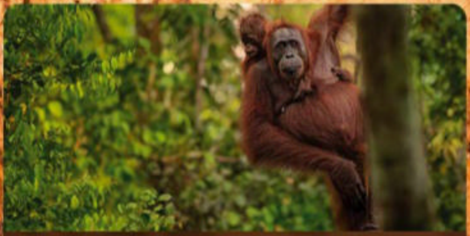

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FOREVER YOUNG

TRILOBITE BEETLE

The prehistoric-looking insect that never grows up

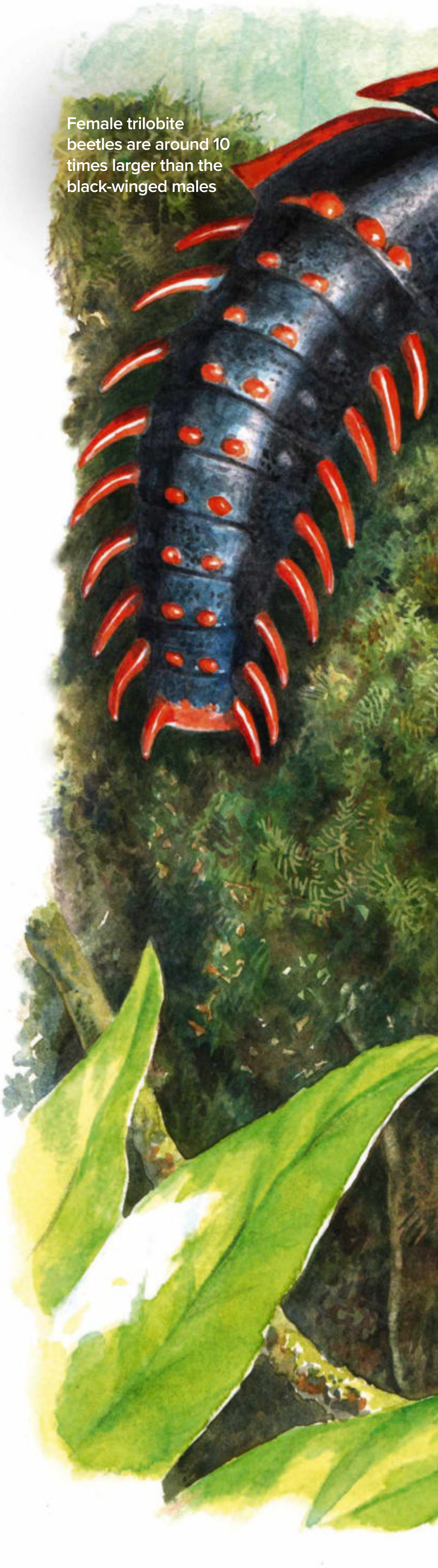
IT WAS THE BUG OF MY DREAMS. AND THERE it was right in front of me, sat proudly atop a rotten tree trunk in a steamy Malaysian forest, as if someone had placed it there for me to find. The mossy green softness of its perch contrasted with its hard and bright edges. Dappled sunlight filtered through the vast forest canopy to illuminate it like a stage spotlight.

The trilobite beetle (*Platerodrilus paradoxus*) is undoubtedly an odd beetle. It is large and spectacular, growing to around 8cm in length, and its textured black body is decorated with bright orange-red spots and trim. It's fair to say that it doesn't really look much like a beetle at all but more like something from another time – as its common name suggests. However, it is not a trilobite or even closely related to one: *Platerodrilus paradoxus* evolved 200 million years after the last trilobite crawled the Earth. Yet it is a beetle of the most extraordinary kind.

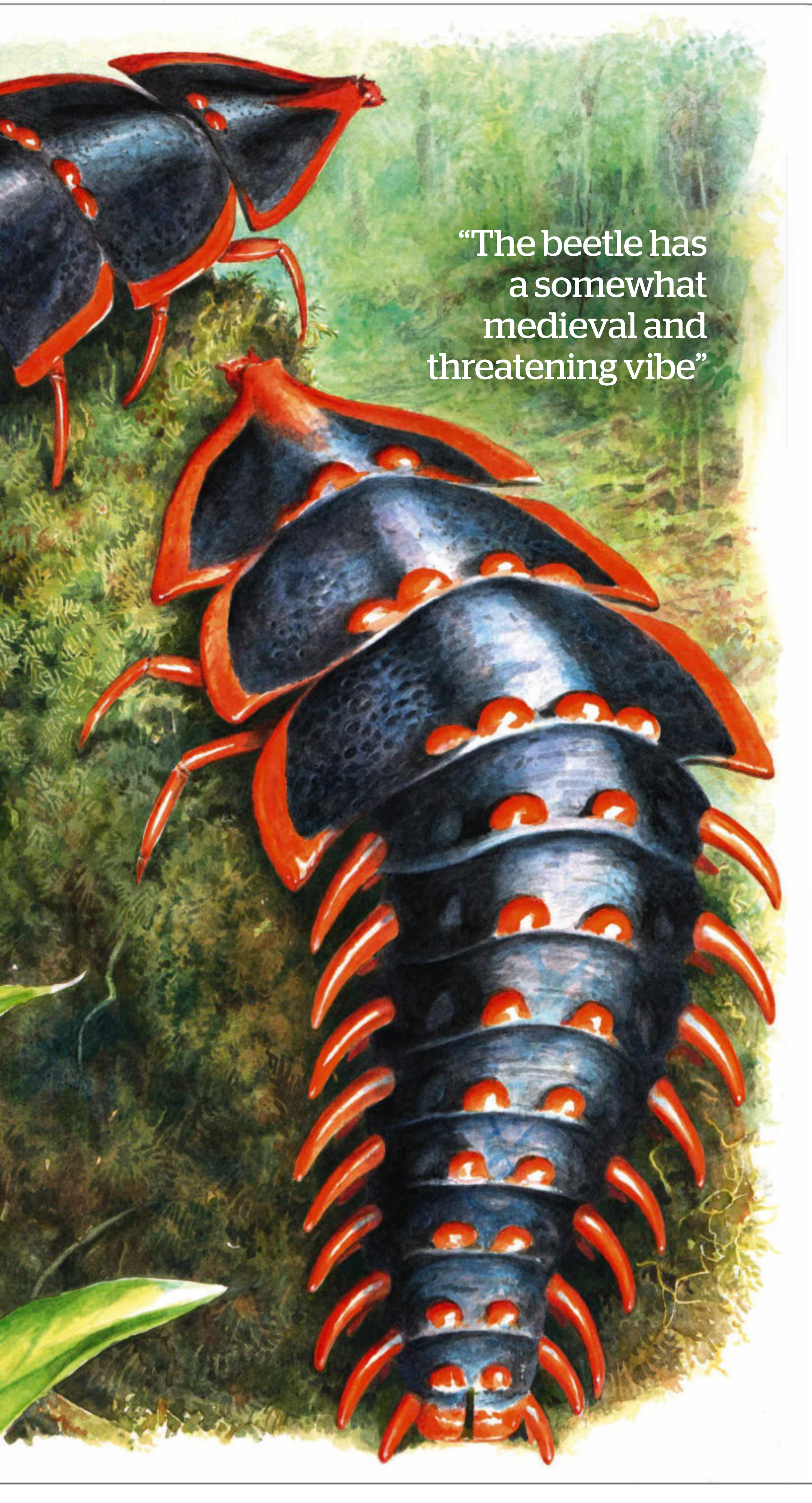
Close inspection confirms it has the obligatory six legs of an insect, each hooked at the tip, which it uses to shuffle along in combination with a sticky, disc-like pad on the underside of the tip of the abdomen. The legs are partially hidden by three massively expanded segments that make up the front part of the body. Between them, they cover and protect the beast's thorax. The slighter and more flexible abdomen comprises smaller segments with mean-looking orange-red spikes. The overall effect is that the beetle has a somewhat medieval and threatening vibe.

After a few moments watching it ambling along, it occurred to me that what I thought was a short proboscis occasionally protruding from under the lip of the pointed front segment was actually the head of the insect in its entirety. Peering down, while holding my breath so as not to send it nervously back into hiding, I could see a pair of tiny, black beady eyes, a stumpy, retractable pair of antennae, and a small mouth. The head would peek out as the animal moved forward but on the slightest disturbance would retreat, tortoise-like, under its armour.

The lack of well-developed sensory organs suggests that neither sight nor feel are of great importance to this insect. But we still know so little about the mysterious *Platerodrilus* family. We don't know how



Female trilobite beetles are around 10 times larger than the black-winged males



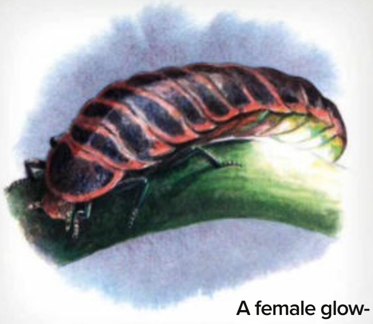
“The beetle has a somewhat medieval and threatening vibe”

many species there are (the current guess is between 20 and about 40). We only know the male or female members of some species. And we have only a few scraps of insight into their life-cycles. Our poor knowledge is largely down to the fact that they can't be kept very effectively in captivity – because we have no idea what to feed them. The lack of large biting mouthparts and their association with moist, decaying wood has led to a theory that they suck up a mushy soup of bacteria, fungus and algae. Some species have been seen to consume slime moulds.

But the most bizarre characteristic of the trilobite beetle is that only the females take on this distinctive prehistoric appearance. They exhibit an unusual life strategy called neoteny, which involves retaining the juvenile form into adulthood. When they first came to the attention of the western world in 1831, the females were thought to be the juvenile stages of an unknown beetle. Puzzled entomologists were dumbfounded when none could be kept to adulthood before they died. It wasn't for another 100 years that one was witnessed mating and the large, lumbering insects were finally correctly identified as adult females, with the males being tiny (8-9mm long) regular-looking beetles, complete with wings and antennae.

The bold markings of trilobite beetles are thought to be aposematic, meaning they act as a warning to other creatures that their bodies contain unpleasant chemicals.

LOOK CLOSER



A female glow-worm lights up

Youthful looks

Another beetle that exhibits neoteny and retains the appearance of the larval stage into adulthood is the glow-worm. While the males look like typical beetles, the flightless females are larger, segmented and look like the larvae. It is the females that put on a nightly light show during summer months.

ILLUSTRATIONS BY PETER DAVID SCOTT/THE ART AGENCY

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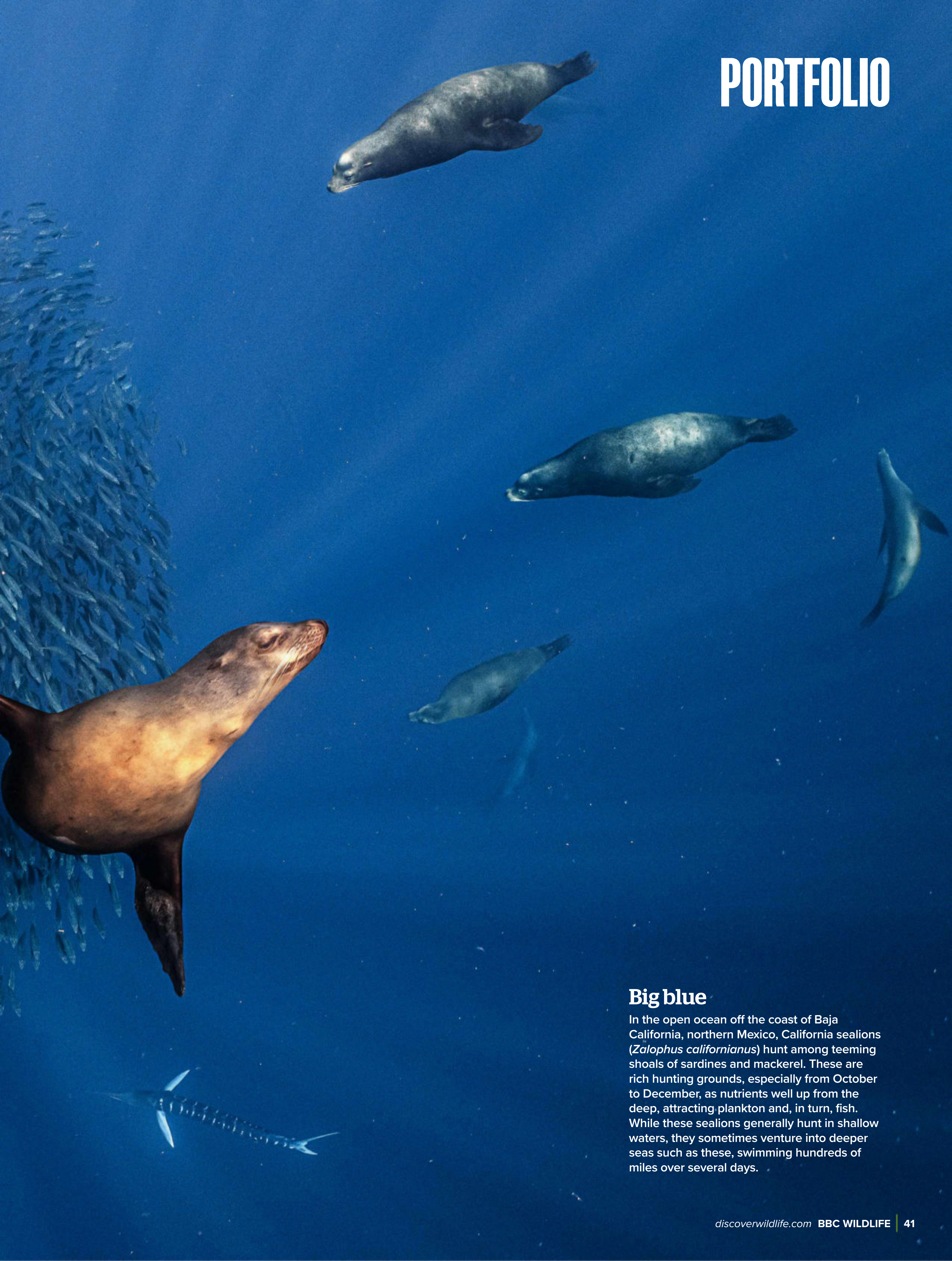
LIONS OF THE OCEAN

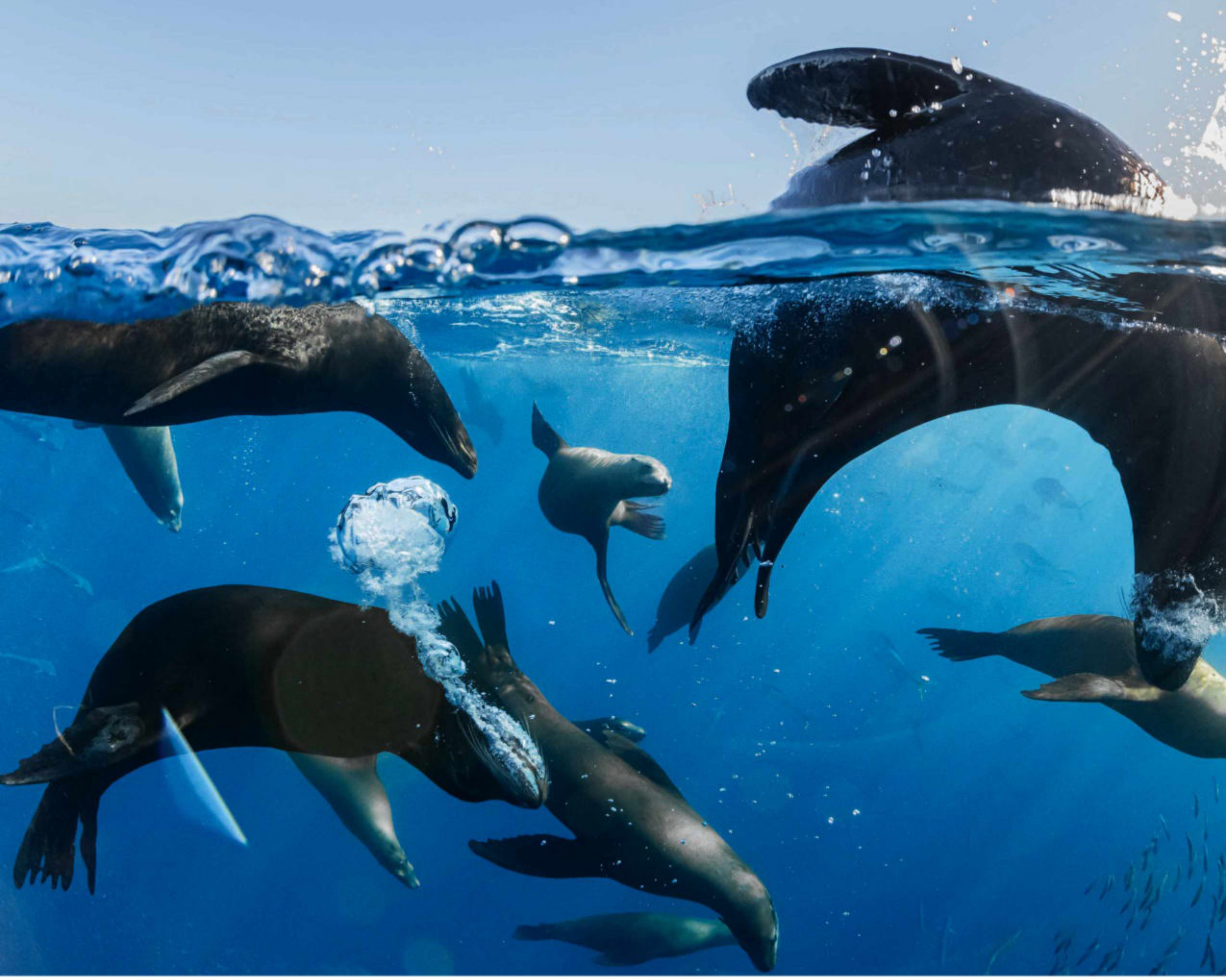
Drawn to seas rich with prey, California sealions gather in colonies off Mexico's Pacific coast. Photographer Henley Spiers captures the lifestyle of these swift and agile hunters

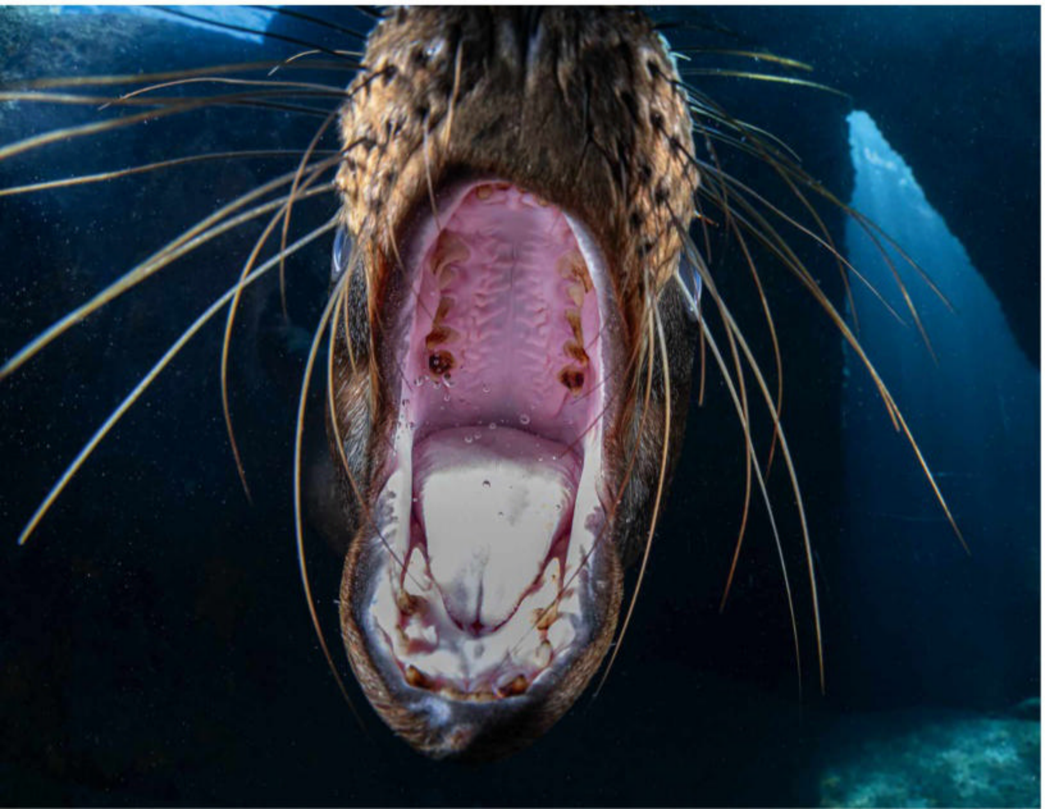
Photos by **HENLEY SPIERS** *Words by* **HENLEY SPIERS AND JOE PONTIN**



Big blue

In the open ocean off the coast of Baja California, northern Mexico, California sealions (*Zalophus californianus*) hunt among teeming shoals of sardines and mackerel. These are rich hunting grounds, especially from October to December, as nutrients well up from the deep, attracting plankton and, in turn, fish. While these sealions generally hunt in shallow waters, they sometimes venture into deeper seas such as these, swimming hundreds of miles over several days.



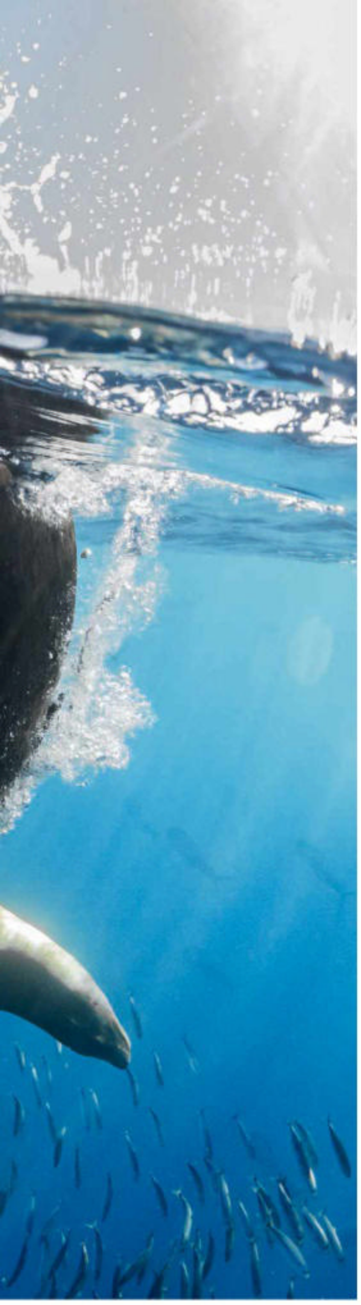


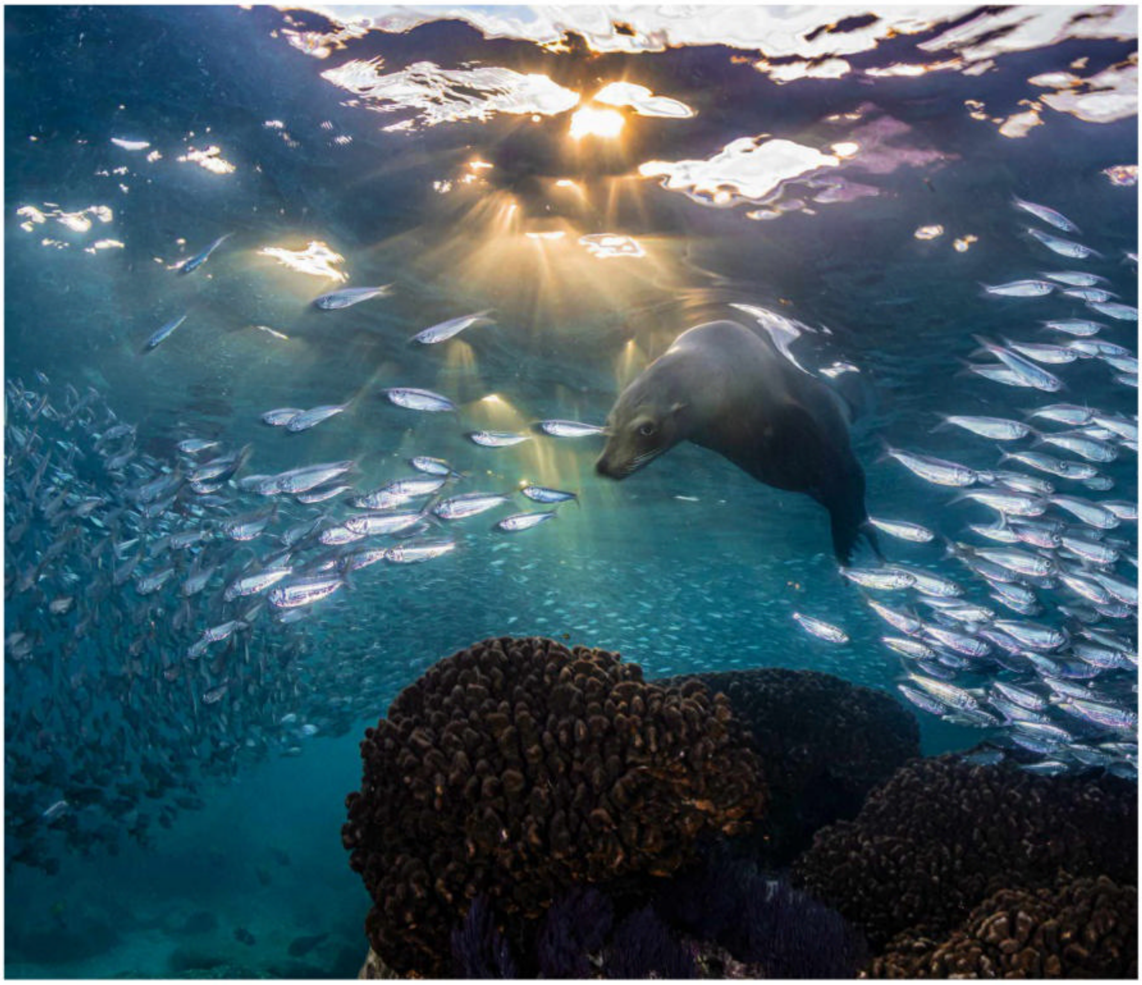
Group dynamics

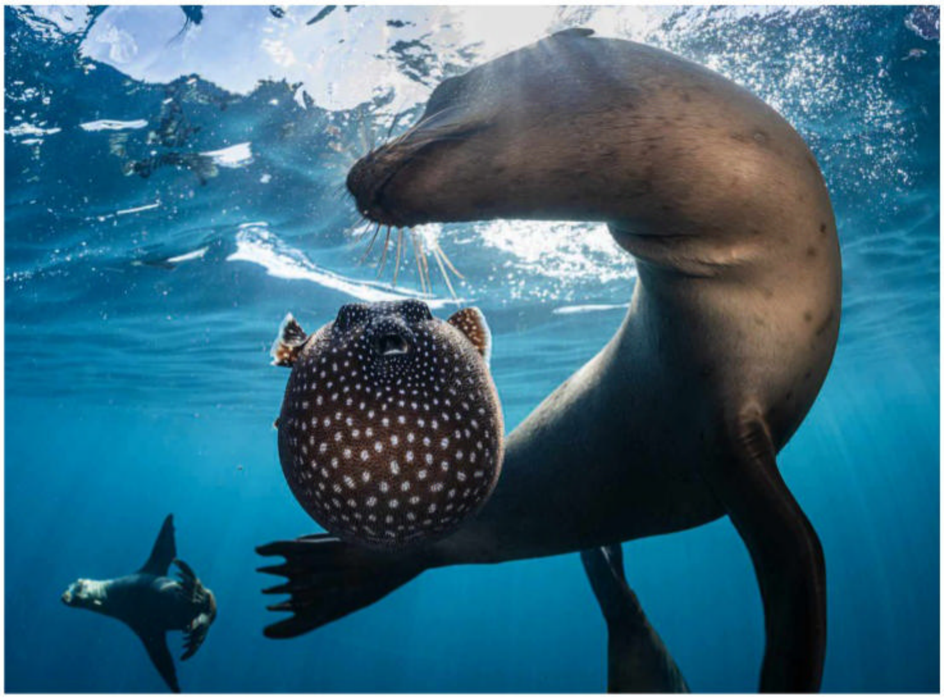
Near the surface of the water, California sealions often gather in groups. They are extremely social animals that, according to Henley, often demonstrate playfulness, anger and affection. This group comprises mainly adult females with some younger males; the dominant bull is out of sight.

Good vibrations

Highly sensitive whiskers (vibrissae) enable California sealions to detect vibrations in the water – allowing them to find prey at night. In one remarkable case, a blind sealion was released back into the sea and survived, hunting using only its whiskers.





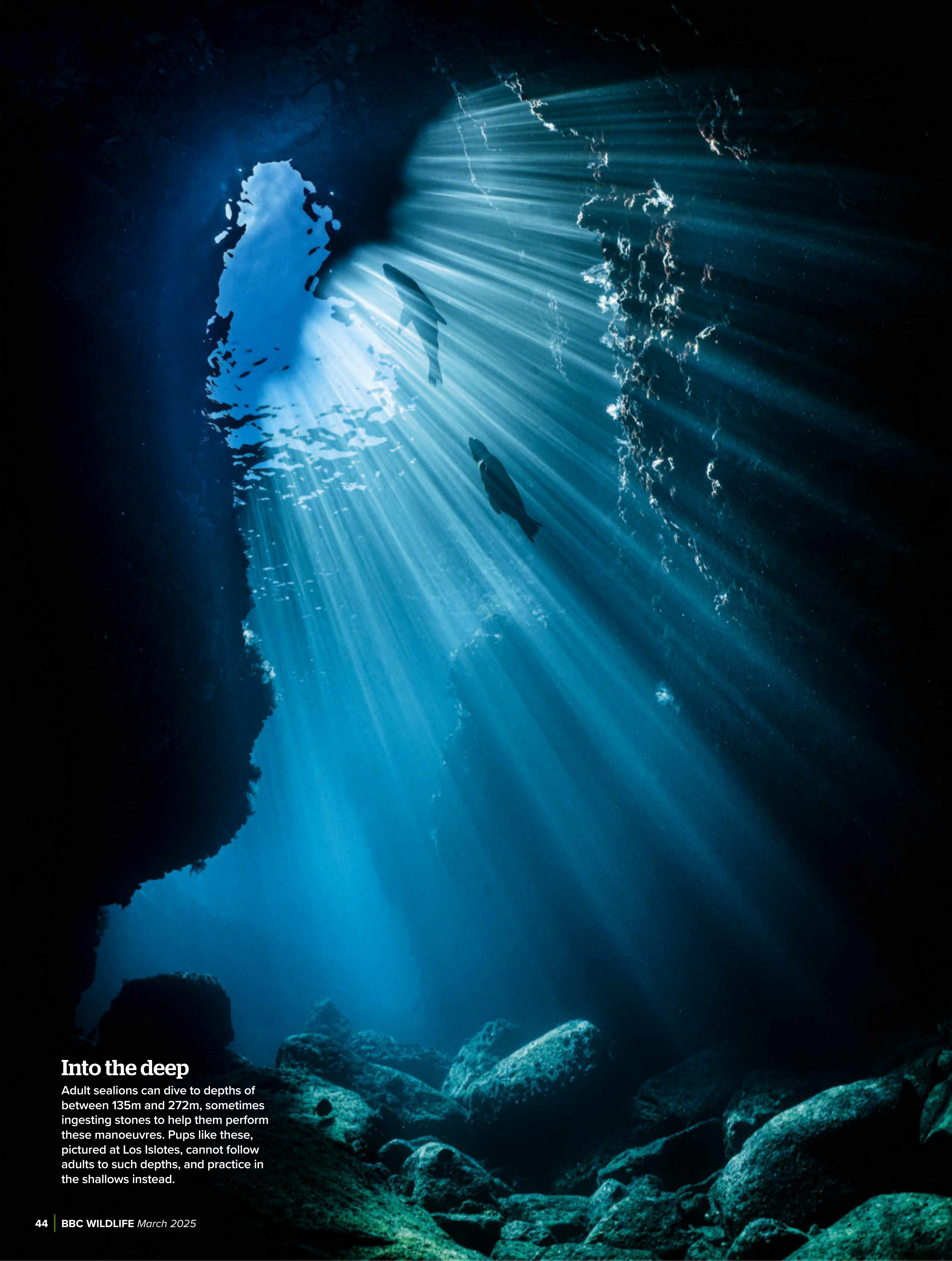


Seeing shoals

Shimmering shoals of sardines part for a curious sealion swimming over billowing clumps of stony coral (*Pocillopora elegans*). Though numbers are down elsewhere off the Baja California Sur, sealions are thriving at Los Islotes, a small island off the rocky and arid Espiritu Santo Island, where many of these photographs were taken.

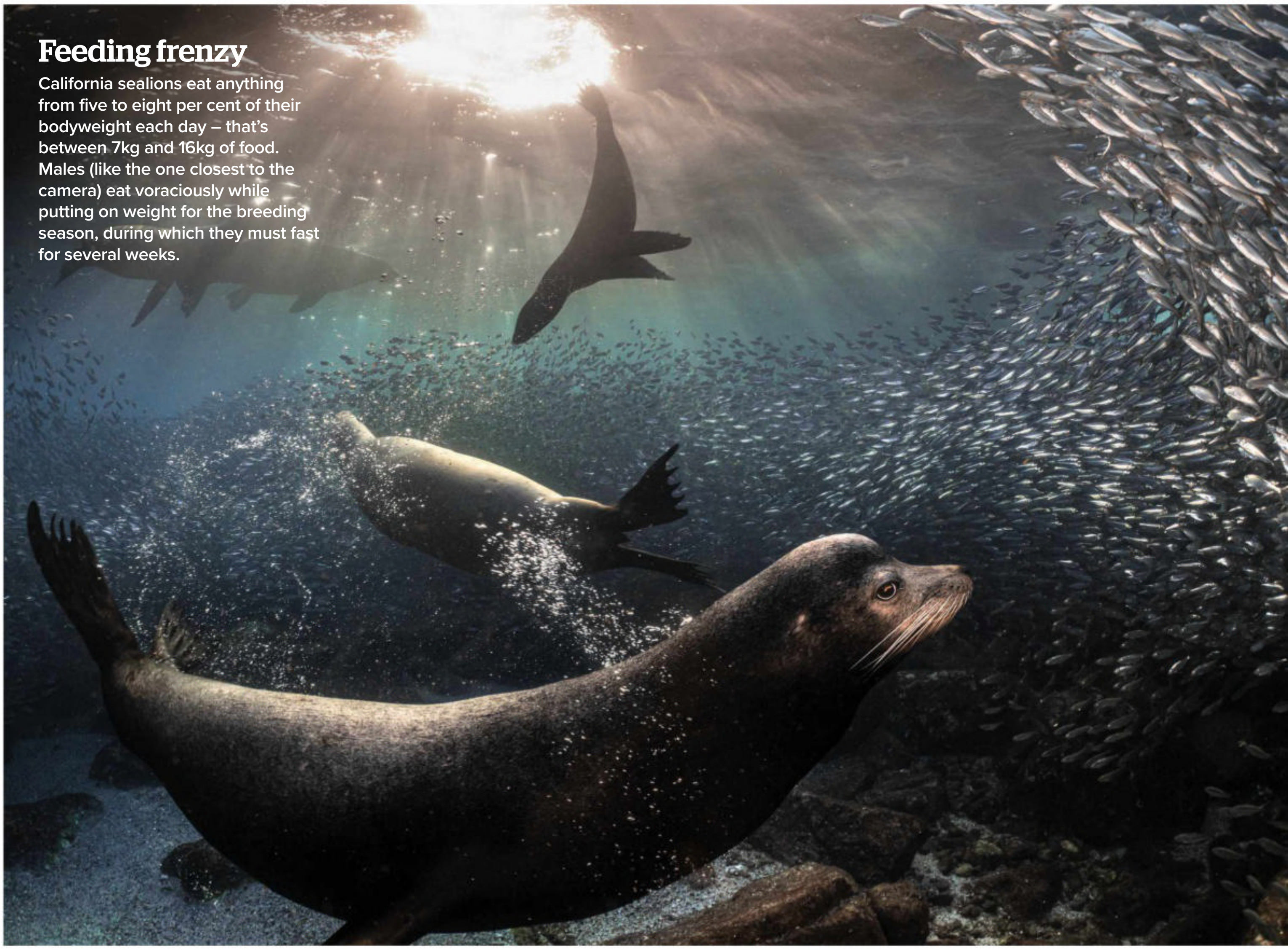
Puffer play

Two boisterous pups toy with a guinea-fowl pufferfish. “The unwanted attention prompted their victim to puff up in its famous defensive manoeuvre, but this only served to heighten the interest of the sealions,” says Henley.



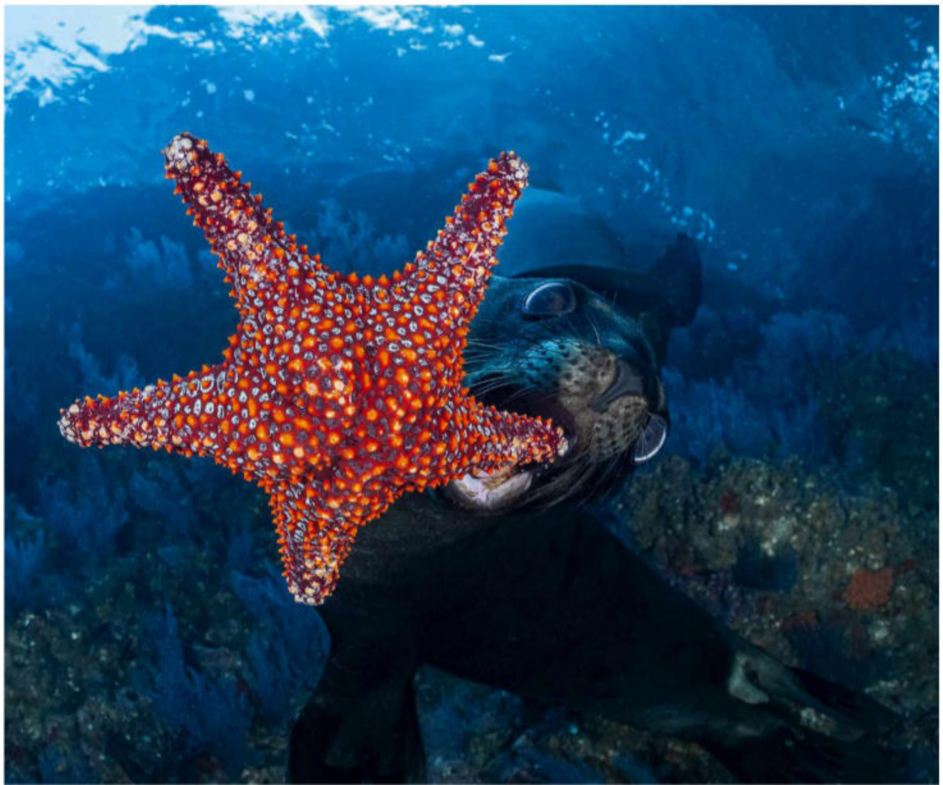
Into the deep

Adult sealions can dive to depths of between 135m and 272m, sometimes ingesting stones to help them perform these manoeuvres. Pups like these, pictured at Los Islotes, cannot follow adults to such depths, and practice in the shallows instead.



Feeding frenzy

California sealions eat anything from five to eight per cent of their bodyweight each day – that's between 7kg and 16kg of food. Males (like the one closest to the camera) eat voraciously while putting on weight for the breeding season, during which they must fast for several weeks.

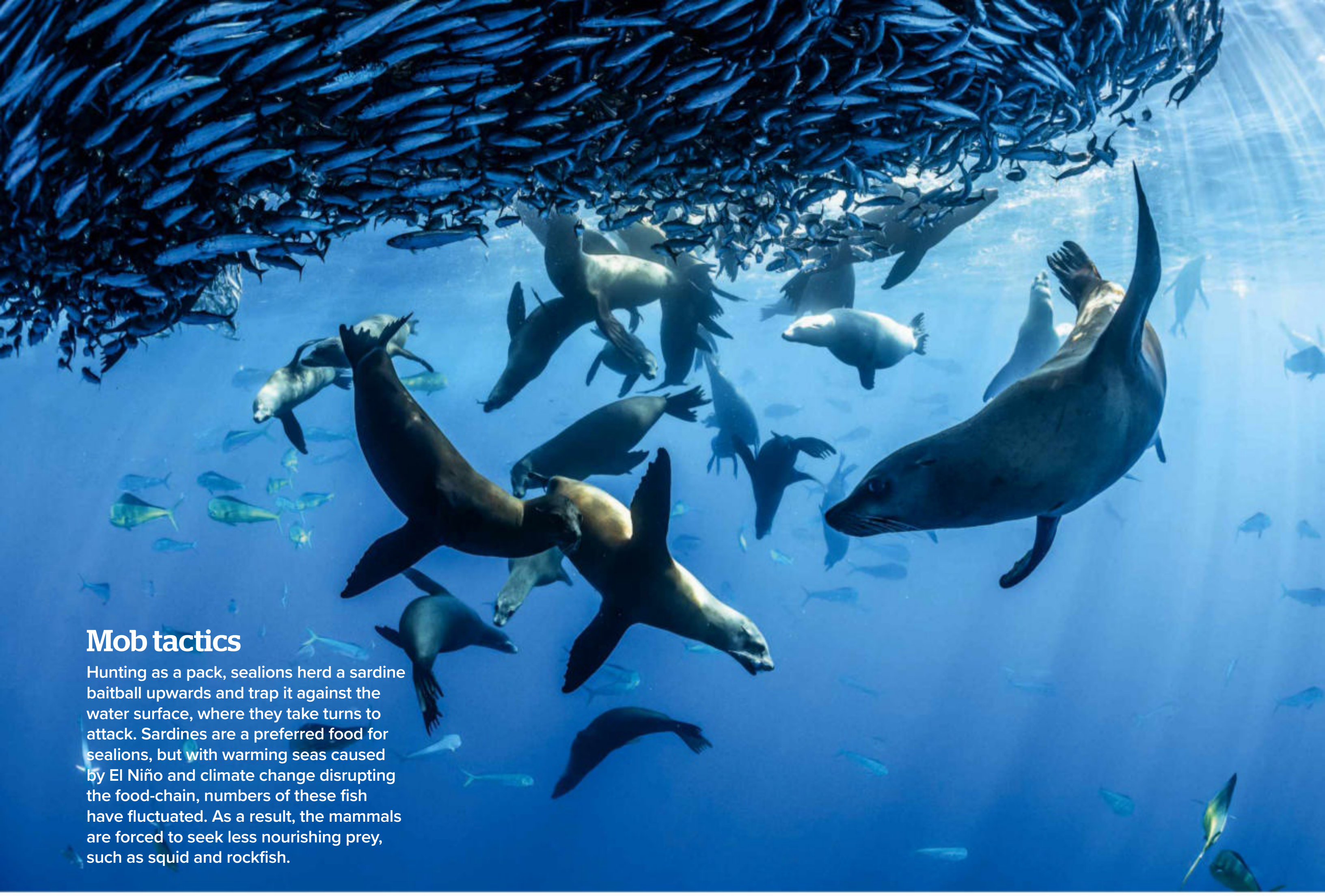


Drop shot

Starfish are another of the sealion's favourite playthings. The mammals pick them up from the seabed, swim to the surface, then drop the star before giving chase. Species such as this Panamic cushionstar have a coarse exterior and seem to survive the experience.

ABOUT THE PHOTOGRAPHER

Henley Spiers is an underwater photographer, writer and expedition leader. He worked as a dive instructor in the Philippines, Indonesia and Saint Lucia before becoming a professional photographer.



Mob tactics

Hunting as a pack, sealions herd a sardine baitball upwards and trap it against the water surface, where they take turns to attack. Sardines are a preferred food for sealions, but with warming seas caused by El Niño and climate change disrupting the food-chain, numbers of these fish have fluctuated. As a result, the mammals are forced to seek less nourishing prey, such as squid and rockfish.

Sea to shore

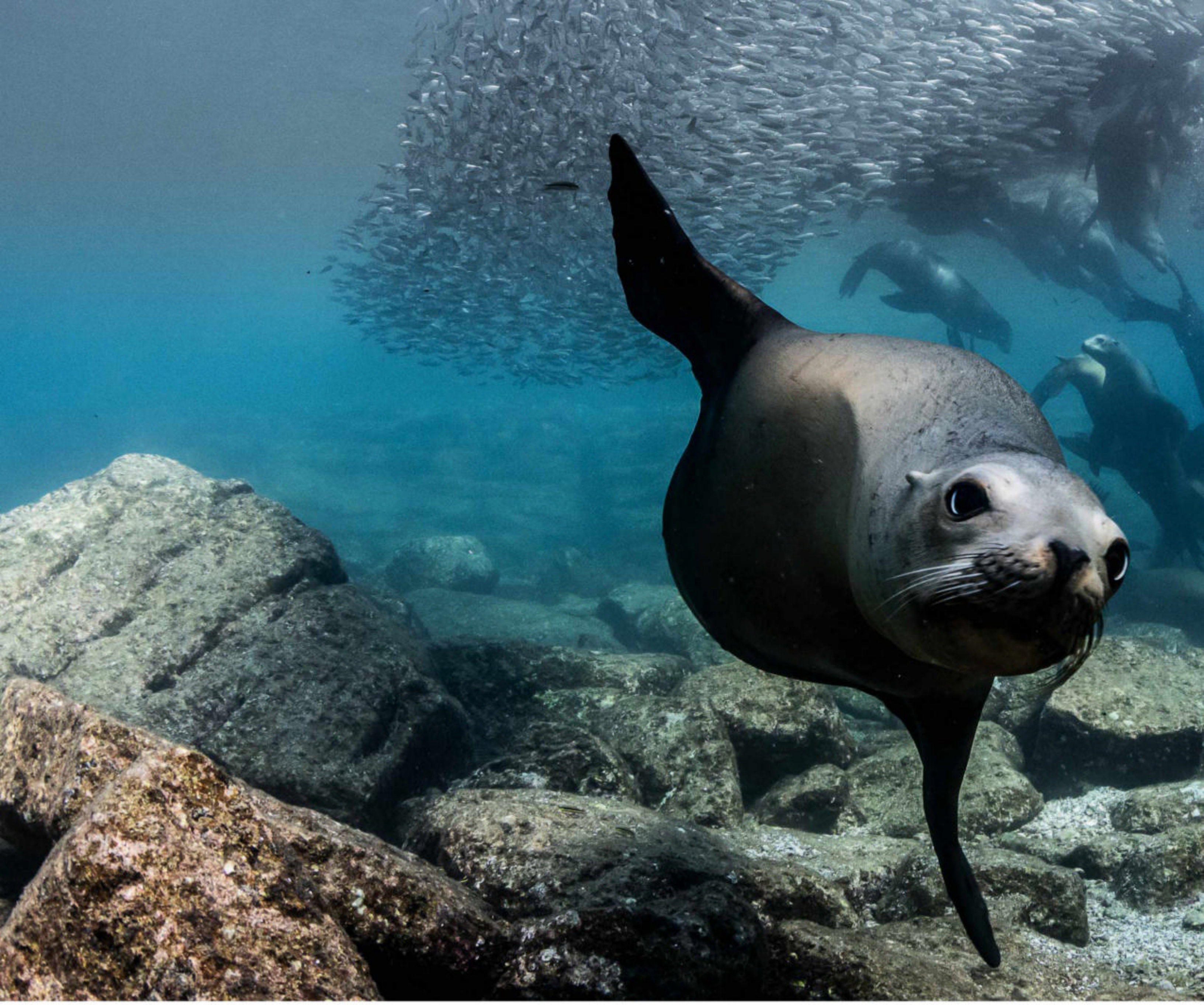
Underwater, the hind flippers function as a rudder; on land, they help sealions to 'walk' – one of the characteristics that distinguish them from seals, which must wriggle on their bellies. Unlike seals, sealions also have visible ear flaps, which is why they are known as 'eared seals'.

Safe haven

In the protected waters of a marine national park, the sealion population at Los Islotes is flourishing, giving this pup a better chance of survival than elsewhere in Baja California – provided it eludes fishing lines, in which some animals become fatally entangled.

Travelling light

A pup porpoises around its colony, jumping in and out of the water as it swims – a more efficient way to move swiftly. The fastest of all sealion species, California sealions can reach speeds of up to 40kph over short distances.

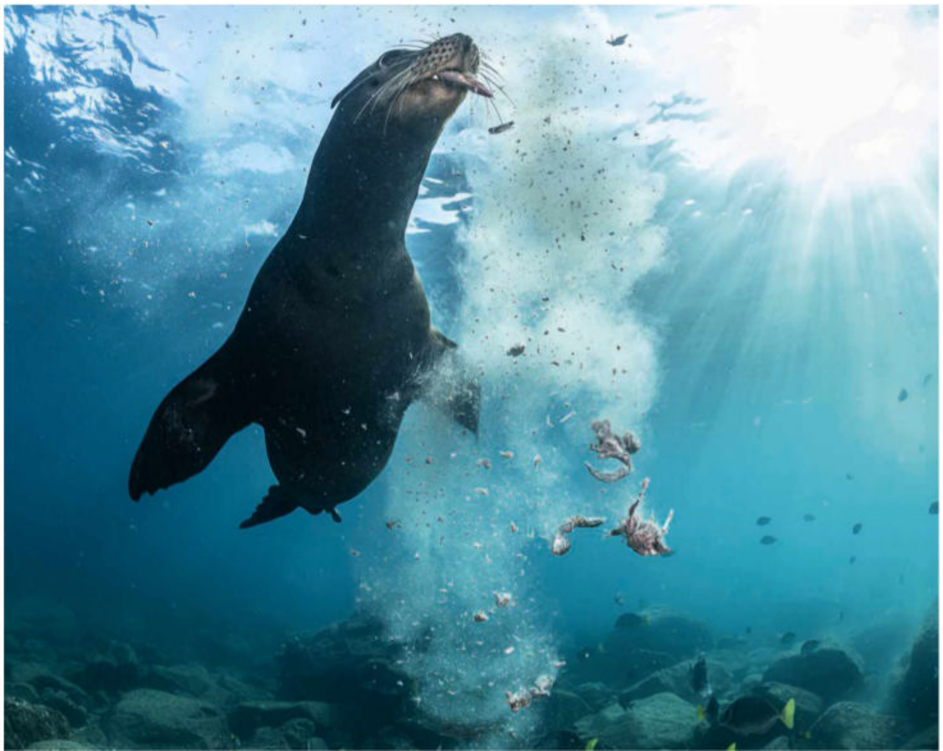


Sharing space

A pup darts away from a hunting pack to investigate Henley. “Sharing the water with sealions can be extremely rewarding as they are curious and playful, especially the younger ones,” he says. “On the other hand, an angry bull may bite, so it is vital to read the situation.”

A hunter hunted

An adult female regurgitates fish bones, prompting a feeding frenzy by reef fish and eels. The sealion may be an efficient predator, but it is also prey for sharks (great white, hammerhead and blue) and orcas.



Cooling off

Sealions have a thick layer of blubber designed to keep them warm in colder northern seas. To keep cool in the warm Mexican climate, they spend more time in the sea, often resting near the surface, sometimes lifting a fin above the water as a form of thermal regulation.

Trucks carrying the elephants carefully ford the Okavango River in Angola

CROSS COUNTRY

Translocating elephants is no mean feat – but it's helping this iconic mammal to reclaim its historic lands

Words and photos by **JIM TAN**

A total of 26 elephants were relocated as part of the project

An elephant is lowered on to a truck ready to be transported to the container

The elephants are darted from a helicopter at first light

THE AIR TINGLES WITH NERVOUS excitement as Alex Oelofse, owner of Okonjati Game Reserve in Namibia, lifts off in a helicopter. Hanging out the side, dart gun at the ready, is vet Hans Reuter, whose sights are set firmly on the elephants below. As the chopper approaches, the animals tense then flee, kicking up a cloud of dust in the golden morning light.

It's August 2024 and the elephants are destined for a new life north of the border. Okonjati's elephant population has grown to double what the land can sustain, a situation exacerbated by six years of drought, and several family groups need to be relocated. Finding a new home for the herd has proved difficult. In much of the species' range, space for elephants has been squeezed to the limit, and burgeoning human and elephant populations increasingly come into conflict.

"Culling isn't really an option, we'd really rather move them," says Alex. "But at some point, you need to make a decision – how are you going to manage the herd before they destroy everything?"

Just as time and options were running out, Alex heard that Cuatir Conservation Area, a private conservation project in south-east Angola, was looking for elephants. Made up of 20,000ha of pristine wilderness nestled in the crook of the Cubango River – a tributary of the Okavango that feeds into the Okavango Delta – Cuatir had ideal elephant habitat but with no elephants. It was the perfect solution.

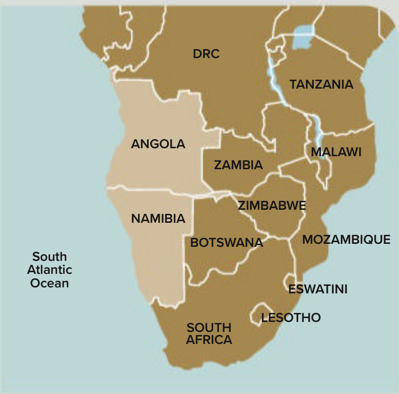
The challenge would be actually getting the elephants there. Cuatir is only 800km from Okonjati but, with the condition of the roads on the Angolan side of the border, not to mention the river crossings, translocation would be very difficult, to say the least.

Luckily, there can be few people more capable of such a difficult endeavour than Alex, a conservationist, helicopter pilot and mechanical engineer. He also happens to be the son of Jan Oelofse, who revolutionised

ABOUT THE AUTHOR

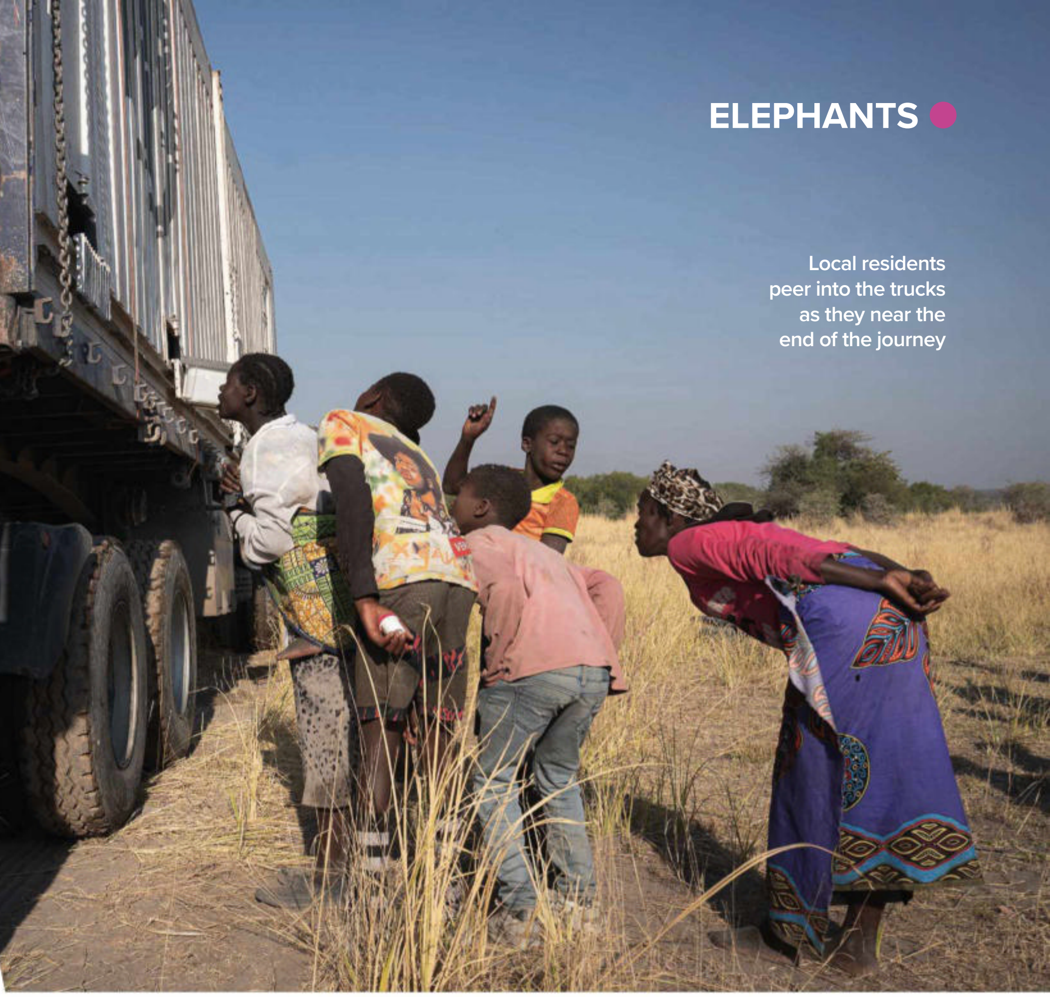
Jim is a freelance photographer and environmental writer based in South Africa. His work focuses on our connection and relationship with the natural world.

Where are Angola and Namibia?

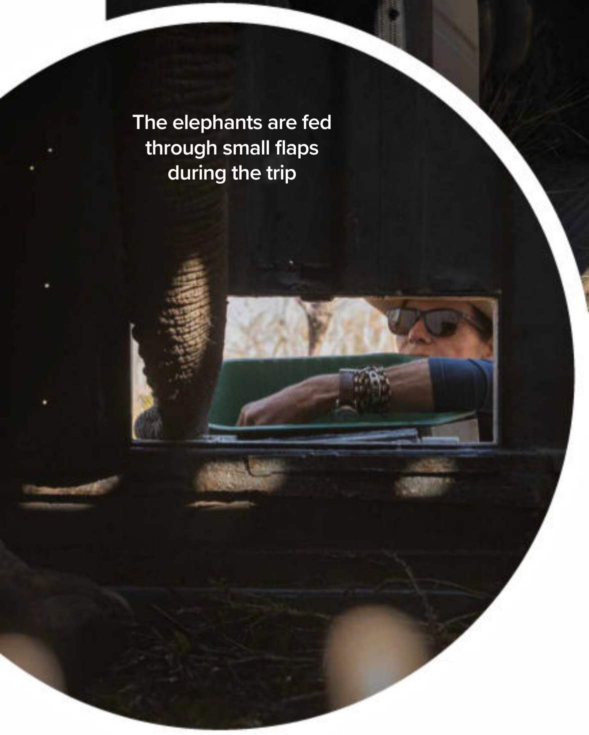


The neighbouring countries of Angola (population 38.5 million) and Namibia (population 3 million) are in the south-west of Africa, and share a coastline along the South Atlantic Ocean.

The African bush elephant is Earth's largest living land animal. It resides in pockets across 23 African countries



Local residents peer into the trucks as they near the end of the journey



The elephants are fed through small flaps during the trip

> “This new approach meant animals could now be translocated in large numbers rather than being culled”

game-capture methods in the 1960s. Back then, if animals needed moving, rangers on horseback would go out and catch them with nets. It was a difficult method with high mortality rates and couldn’t be carried out at scale. Jan pioneered a method using a capture funnel made of woven plastic sheet walls leading to a boma, into which animals could be herded using a helicopter.

IN THE 1960s, MANY OF THE SOUTH African national parks where Jan was working were becoming overpopulated. With his new approach, still known as the Oelofse Method, Jan increased his team’s catching capability from 600 animals a year to 6,000. This meant that, rather than animals having to be culled, they could now be translocated in large numbers to repopulate conservation areas elsewhere in southern Africa.

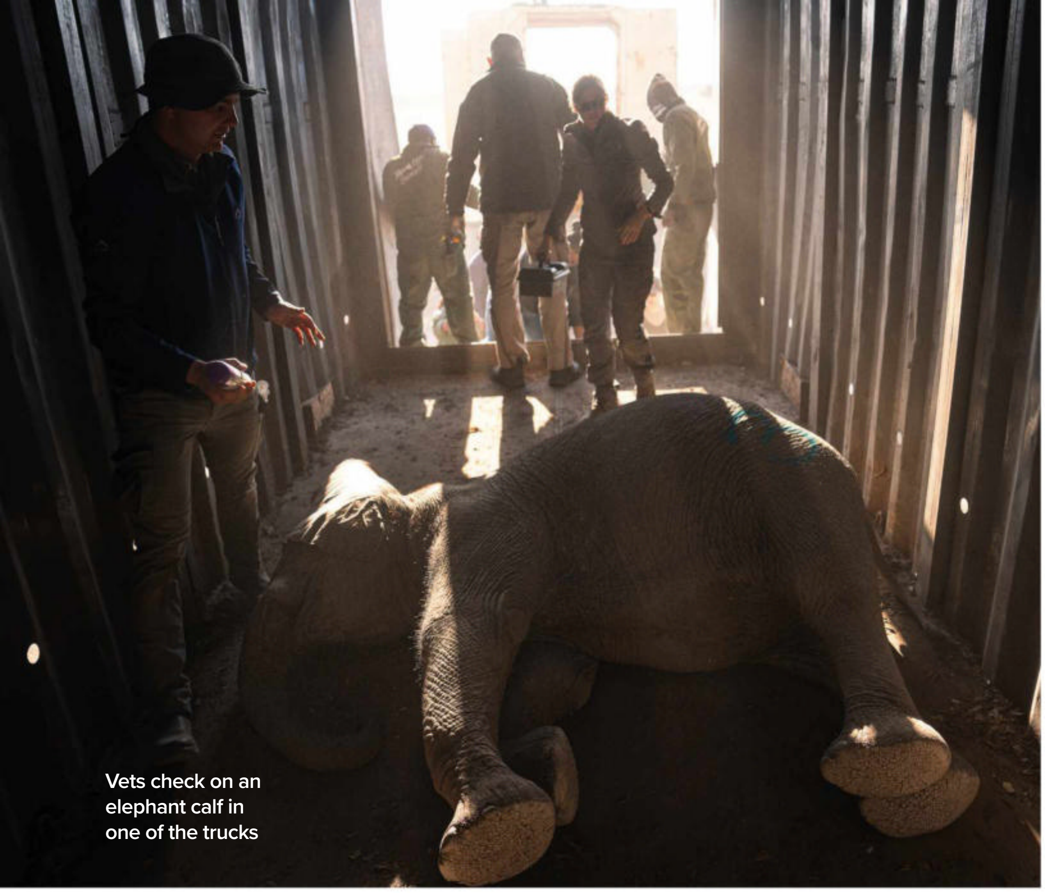
Alex deftly manoeuvres the chopper through the sky. This is the second of the four trips as part of this translocation to Angola and he knows what he is doing. He circles the herd and picks out the chosen family group. The radio in the land cruiser below crackles into life: two elephants have been darted and will be going down in the next 10 minutes. The ground crews speed through the bush towards the elephants – it’s vital to reach them quickly to ensure they can breathe in the positions they have fallen.

The crews operate with practised precision. On reaching the first elephant, key measurements and blood samples are taken by the veterinary team, while the capture team sets up a crane and attaches straps around the enormous feet. Suddenly, there’s a warning shout. Another elephant has circled back to investigate what has happened to its fallen friend. The team retreats to the relative safety of the truck while a land cruiser diverts the interloper.

Thankfully, the inquisitive elephant turns and retreats, allowing the team to continue its work, hoisting the unconscious elephant skywards by its feet. Using an ingenious system of adapted shipping containers and chain pulleys, the process is repeated until seven elephants have been loaded on to two waiting trucks. They are woken up and, after a few indignant trumpets, the precious cargo is ready for the long journey ahead.

The first 400km glide by and four hours later the team reaches the Angolan border. The crossing is a stark illustration of the contrasting situations between the two

Tank-like tracks are fitted to the trucks to help them along a sandy trail in miombo woodland



Vets check on an elephant calf in one of the trucks

ANGOLAN CIVIL WAR

Lethal legacy

The civil war, which lasted from 1975 to 2002, left Angola as one of the world's most land-mined countries – a lethal legacy that continues to haunt its human and non-human residents more than two decades after the fighting stopped.

The HALO Trust, a UK-based de-mining NGO, has cleared more than 120,000 landmines in Angola over the last 30 years. In the past four years, a $60m grant from the Angolan government has allowed HALO to clear minefields around two national parks in south-east Angola to help unlock the region's conservation potential.

Elephants being killed by landmines is now a rare occurrence. However, until the province can be declared mine-free, ecotourism is a hard sell for all but the most intrepid travellers – and ecotourism dollars still play a pivotal role in most sustainable conservation funding models.

nations as the smooth road gives way to a potholed track. The next 200km take 12 bone-jarring hours, with the teams trying to make the passage as comfortable as they can for the elephants.

At first light, the two container trucks plough into the crystal-clear waters of the Okavango River, each pulled from the front by a six-wheel-drive vehicle. It's a tense moment – if the trucks were to get stuck here, rescuing the elephants would be a monumental effort.

But it's after fording the river that things get really tough. The final 40km follow a deep sandy track that winds through miombo woodland. On Alex's previous translocation, even with extra six-wheel-drive vehicles helping to pull the lorries, this final stretch took more than 24 hours to complete.

Learning from that experience, Alex has custom-built tank-like tracks for his trucks out of rubber and steel. The convoy pauses, and some of the team bolt the tracks on while others tend to the elephants, cutting vegetation from the riverbank and offering up buckets of water. For the residents of the small village by the riverbank, it's a sight to behold and one they are unlikely to forget in a hurry. Young and old alike look on in wonder as the tip of a trunk emerges from the container, searching for more food.

Even with the new tracks, those 40km take a gruelling 16 hours. Hidden tree roots slash seven tyres over the course of the journey. Each time, the crew springs into action like a well-oiled machine, digging out beneath the truck, removing the tracks and then changing the mammoth tyres. They are driven by a deep care for the elephants on board, working tirelessly as day passes into night, overcoming each obstacle thrown at them with quiet determination.

"Angola once had one of the largest elephant populations in Africa," says Mike Chase, founder of Elephants Without Borders, a Botswanan-based NGO. "And then during the civil war, which started in the mid-1970s, populations were decimated, mainly by the rebels, who sold their ivory to fund the war."

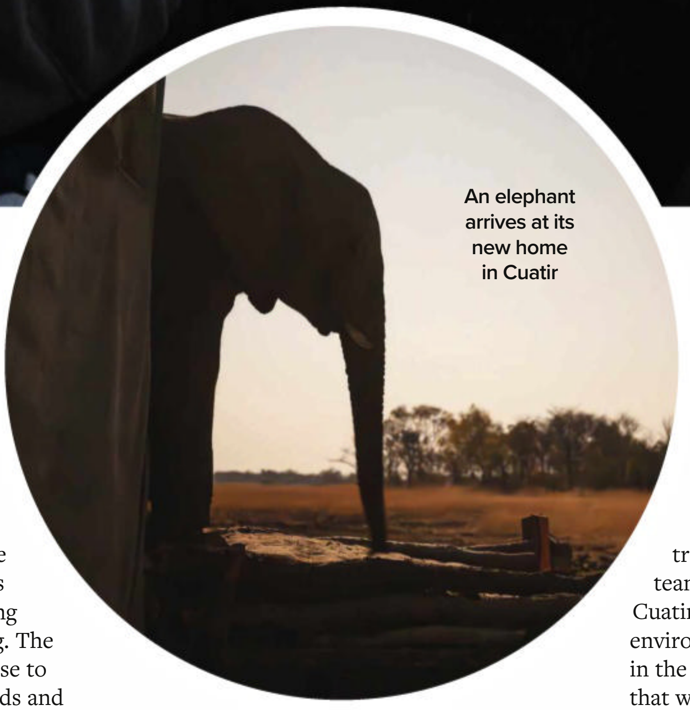
By one estimate, as many as 100,000 elephants were killed during Angola's 27-year conflict. When Chase arrived in south-east Angola to survey elephants for his PhD in 2004, two years after the end of the war, he found only 300 elephants in a region that once would have been home to tens of thousands. But unlike many places in the elephants' former range where humans have taken up the available space, there are still thousands of square kilometres of wilderness in Angola that elephants haven't yet returned to but potentially could – including at Cuatir.

One of the main reasons that the space is still available is that the sandy soils that underpin the miombo woodlands in Angola's south-eastern province, Cuando Cubango, make both access and agriculture extremely difficult. Outside of the province's few urban areas, sandy tracks are the only way to cross a region that measures 200,000km^2. The result is a population density of under three people per km^2, roughly 100 times lower than in the UK.

In neighbouring Botswana and Zambia, growing human and elephant populations are often competing for the same space, and human-wildlife conflict is becoming an increasingly prominent political issue. In April 2024, following a row over trophy hunting, Botswanan president Mokgweetsi Masisi threatened to send 20,000 elephants

> "Residents of the small village look on in wonder as the tip of a trunk emerges from the container"

These elephants require around 150-170kg of food per day



An elephant arrives at its new home in Cuatir

to Germany so that the German people could experience what it was like to live with such large and powerful creatures.

ELEPHANTS ONCE moved freely across southern Africa including between Botswana, Zambia, Namibia and Angola. Some of the overcrowding in Botswana is a result of Angolan elephants fleeing during the war and never returning. The idea of elephants returning en masse to Angola to reclaim their ancient lands and thus relieve the escalating issues of human-wildlife conflict in neighbouring countries is, understandably, highly appealing to conservationists such as Chase. It also has real appeal for Angolan leaders peering across the border at the ecotourism dollars flooding into Botswana's Okavango Delta.

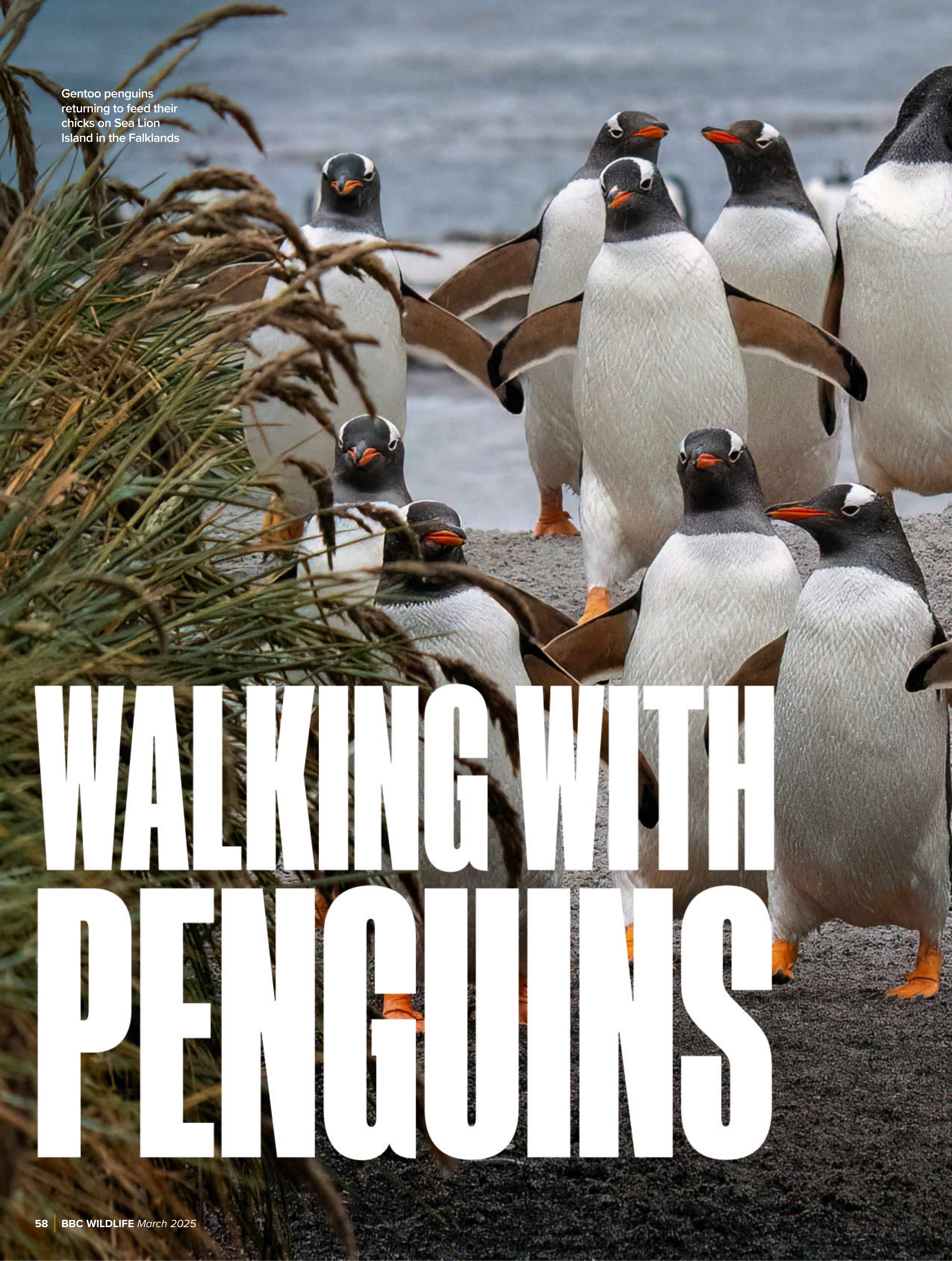
The optimistic vision of elephants returning to Angola has struggled to become a reality though, with elephant numbers first rising and then falling again over the past 20 years due to ivory poachers. The challenges that keep human population numbers low also make it incredibly hard for Angolan park rangers to patrol and protect the region. The lack of access and legacy of landmines also make the region a tough sell for tourists, who represent an important revenue stream for anti-poaching activities in other southern African countries.

A day-and-a-half after its journey began, the container lorry backs up to a purpose-built ramp in a cloud of Angolan dust. The doors creak open and a quiet hush descends as the team waits in anticipation for the elephants to emerge. In the first container, a mother and calf carefully approach the now-open doors, tentatively sniffing at the new smells drifting towards them on the evening breeze. The female stays at the door for some 40 minutes, flicking her trunk, unsure what to make of her new surroundings before ponderously descending on to the floodplain and ambling off into her new life at Cuatir.

Over the course of four translocations in August, the Oelofse team brought a total of 26 elephants to Cuatir, which are now thriving in their new environment. Their numbers are but a drop in the ocean compared to their predecessors that walked the land before them, but their presence is deeply symbolic.

This translocation was only possible with the permission of the Angolan government, reflecting what Chase believes is a newly invigorated, positive attitude towards conservation. It was also only possible because safe space had been made available for elephants – something Chase's research is showing may also be improving in other areas of south-eastern Angola.

After years of doubt, the vision of Angola as one of the most important global areas for elephant conservation may soon be more than just a dream.



Gentoo penguins returning to feed their chicks on Sea Lion Island in the Falklands

WALKING WITH PENGUINS

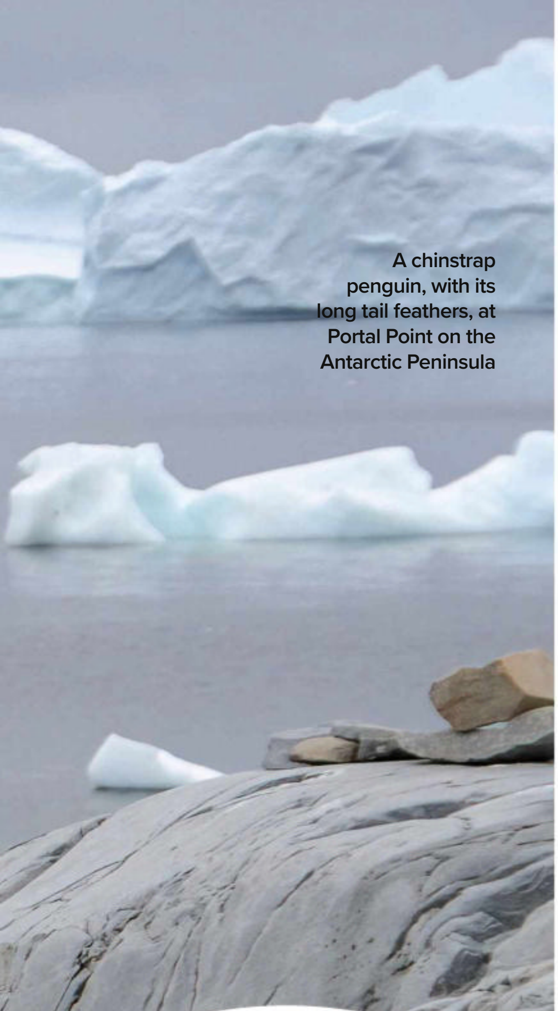
Words and photos by
URSULA CLARE FRANKLIN

Mourning her late husband, photographer Ursula Clare Franklin needed a new direction. Soon she was travelling the world, on a quest to photograph her favourite animal, the penguin – all 18 species of them

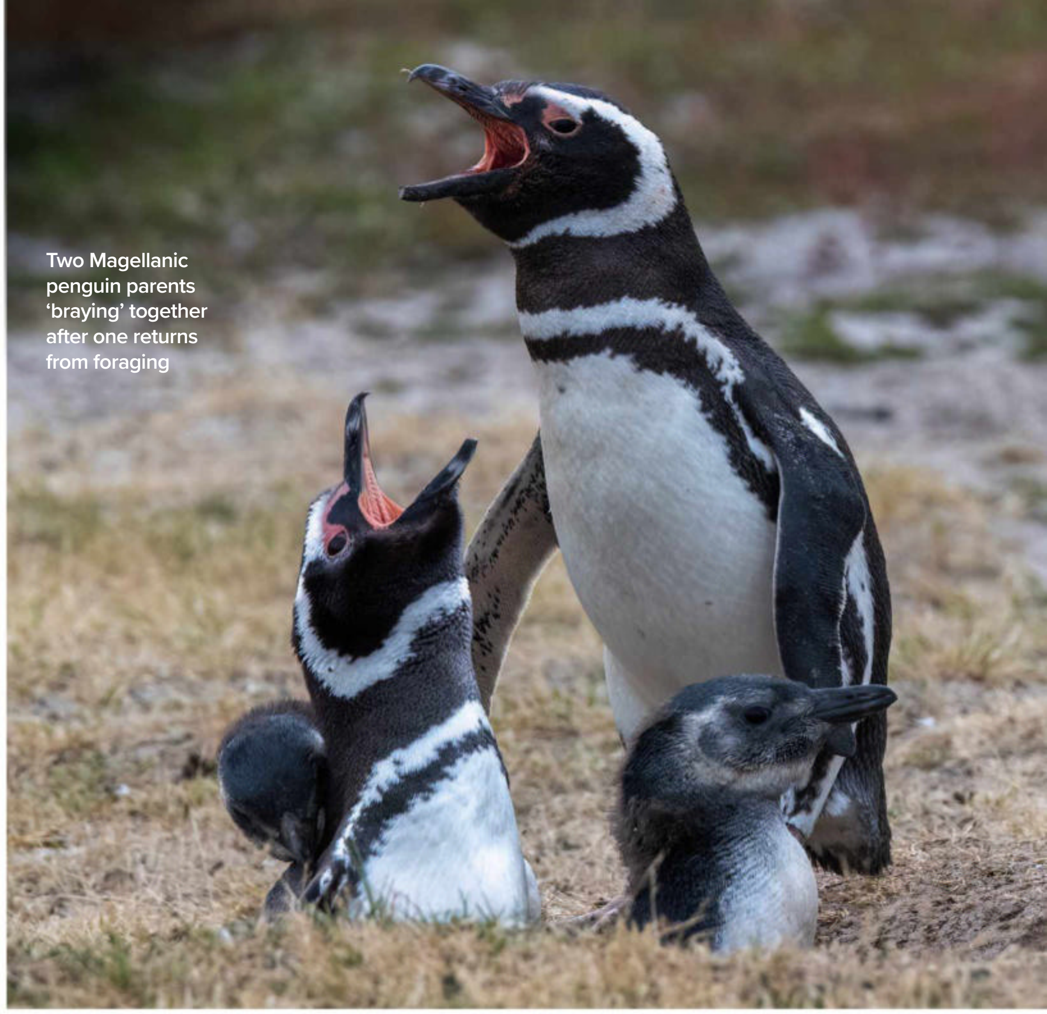
IN JULY 2012, AS WE APPROACHED our 25th wedding anniversary, my husband Ralph died suddenly, following a major heart attack. In my grieving state, I knew that keeping busy and having goals were essential to my healing, but I had no idea what direction to take.

Several months later, a friend was showing me photographs from her trip to Antarctica and it suddenly came to me: penguins. I have loved penguins since I was a child and delighted in their tuxedo-like plumage and funny antics, not to mention their diversity and incredible behaviour. Without thinking, I found myself announcing that I was going to photograph every species of penguin in its natural habitat. And with that, Mission Penguin was born.

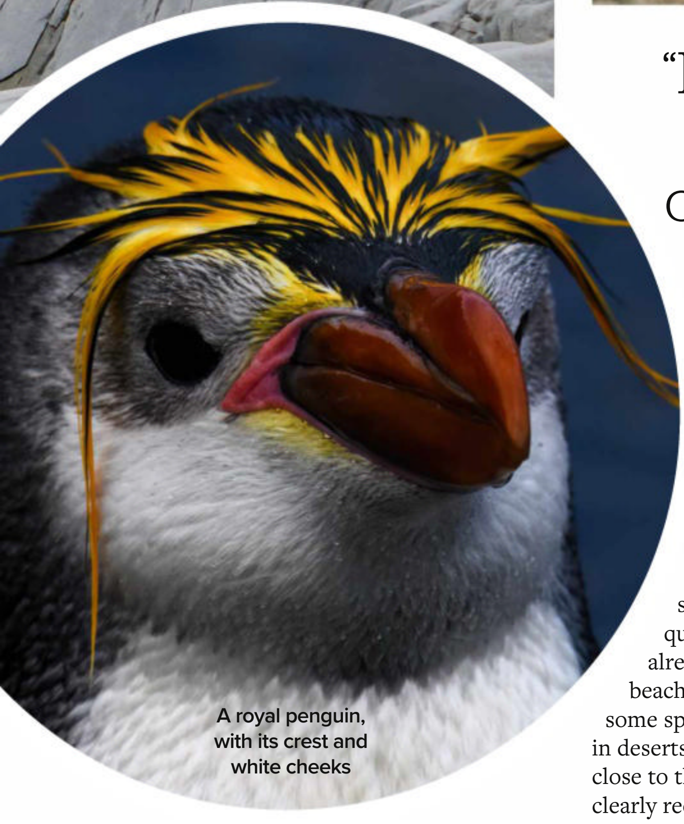
At this stage I wasn't sure how many species of penguin there were. I quickly confirmed that there were 18, scattered across the southern hemisphere, in some of the remotest places in the world. This was going to be a challenge – but there was no going back.



A chinstrap penguin, with its long tail feathers, at Portal Point on the Antarctic Peninsula



Two Magellanic penguin parents 'braying' together after one returns from foraging



A royal penguin, with its crest and white cheeks

> "I was amazed to find that some species breed in forests, while others live close to the equator"

During my marriage, I had seen three penguin species: the African penguin in South Africa; and the little and yellow-eyed penguins while on South Island, New Zealand. This meant tracking down 15 more species to complete the quest.

Most people associate penguins with snow but many species have evolved to thrive in quite different habitats. While I'd already seen penguins on African beaches, I was amazed to find that some species breed in forests, and another in deserts. Others even make their home close to the equator. Mission Penguin would clearly require a lot of travel so, to minimise my flying time and carbon footprint, I grouped closely located species together.

MY INAUGURAL EXPEDITION was in February 2016, to the Antarctic Peninsula and the Falkland Islands. Antarctica was like another world. The sheer beauty of this icy white landscape was mesmerising and gave me a sense of deep peace.

I was just getting over the euphoria of my first landing on the continent when I spotted a lone chinstrap penguin, which waddled right over to me. It appeared to be smiling at me, though the apparent 'smile' was actually a narrow black band of face feathers running from ear to ear, which resembles the strap of a black helmet. This was my first new species and, while I was elated, I couldn't help but shed a few tears. My healing journey had begun.

The chinstrap is one of three penguin species that live on the Antarctic Peninsula, a group collectively known as brush-tailed penguins on account of their long, stiff tail-feathers. Soon I had spotted the other two: the Adélie, sporting distinctive white eye-rings; and the gentoo, with its bright orange bill.

The expedition ship next moored at Stanley, capital of the Falkland Islands, the South Atlantic archipelago where I was hoping to see another four species.

ABOUT THE AUTHOR

Ursula is a nature photographer based in Somerset. Her book *Mission Penguin* (Bloomsbury, £25) is out now. See more of her work at f4inspirationalimages.co.uk.

Squabbles often break out among king penguins and flippers are used for slapping opponents

With ruggedly beautiful coastlines, fewer than 4,000 people and more than a million penguins, the Falklands would quickly become one of my favourite destinations.

The southern rockhopper was my first crested penguin. This tenacious bird nests in dense colonies on cliffs up to 60m above sea level and is known to take 'showers' (*see box*). It must leave the colony daily to forage for food, and the return journey to its cliffside home is incredibly arduous. I watched as rockhoppers, which appeared as tiny black specks in the waves, suddenly leapt from the water and frantically 'hopped' up the cliff-face, trying to reach safety before the next wave arrived. They were frequently knocked off their feet and swept back into the turbulent swell, only to try again. The southern rockhopper, it seems, knows how to persevere and bounce back from life's challenges.

I'd seen gentoo penguins already, on the Antarctic Peninsula. But on the Falklands I witnessed all stages of the species' breeding cycle – from mating to nest-building (for which they collect pebbles from the beach), newly hatched chicks and older chicks chasing their parents to demand a meal. I also saw them swim. The gentoo is the fastest-swimming penguin, reaching speeds of up to 35kph, leaping in and out of the water like a dolphin. These encounters gave me fantastic photo opportunities.

With sightings of Magellanic, king and a few macaroni penguins, I'd now spotted all the species I had hoped for from this first expedition. With the three I had previously seen, this made 10 of the 18 – so I was already just over halfway there.

There are four species of banded penguin. They are the most northerly of all penguins, found in South America and southern Africa, and look very similar in appearance, with monochrome bands striping their faces, neck and chests. I'd

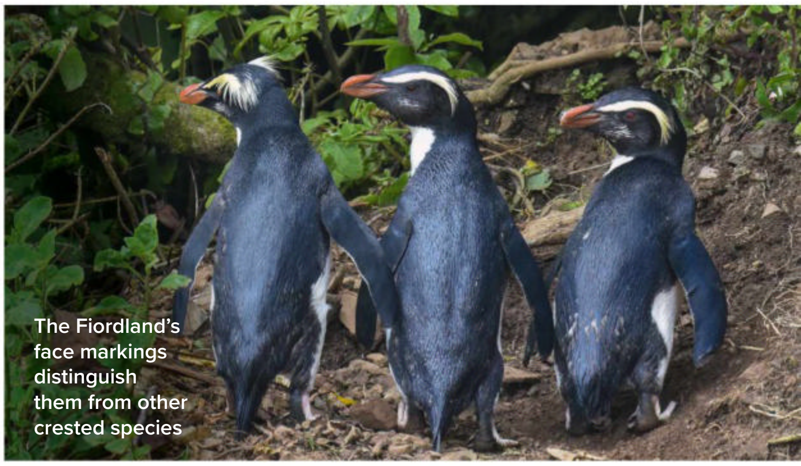
A gentoo, the third largest penguin species, 'porpoises' back to the shore

A quick shower

On Saunders Island, one of the Falkland Islands, southern rockhoppers are partial to a freshwater shower. The facility is provided by water running down the side of a cliff and cascading over an overhanging rock. The birds queue for the shower, which helps to remove dirt and parasites, and maintains feather waterproofing from their preening afterwards. It also helps them to keep a comfortable body temperature and stay hydrated.

Southern rockhoppers mainly eat fish, squid and octopuses

The Galápagos population consists of around only 1,200 mature individuals



The Fiordland's face markings distinguish them from other crested species

> "Our walk to reach the Fiordland penguins was not for the faint-hearted, as we slid our way down to the beach"

seen the Magellanic and African, which just left the Humboldt and Galápagos. So my next trip, in April 2017, saw me landing in Lima, Peru, and catching a boat out to the Ballestas Islands.

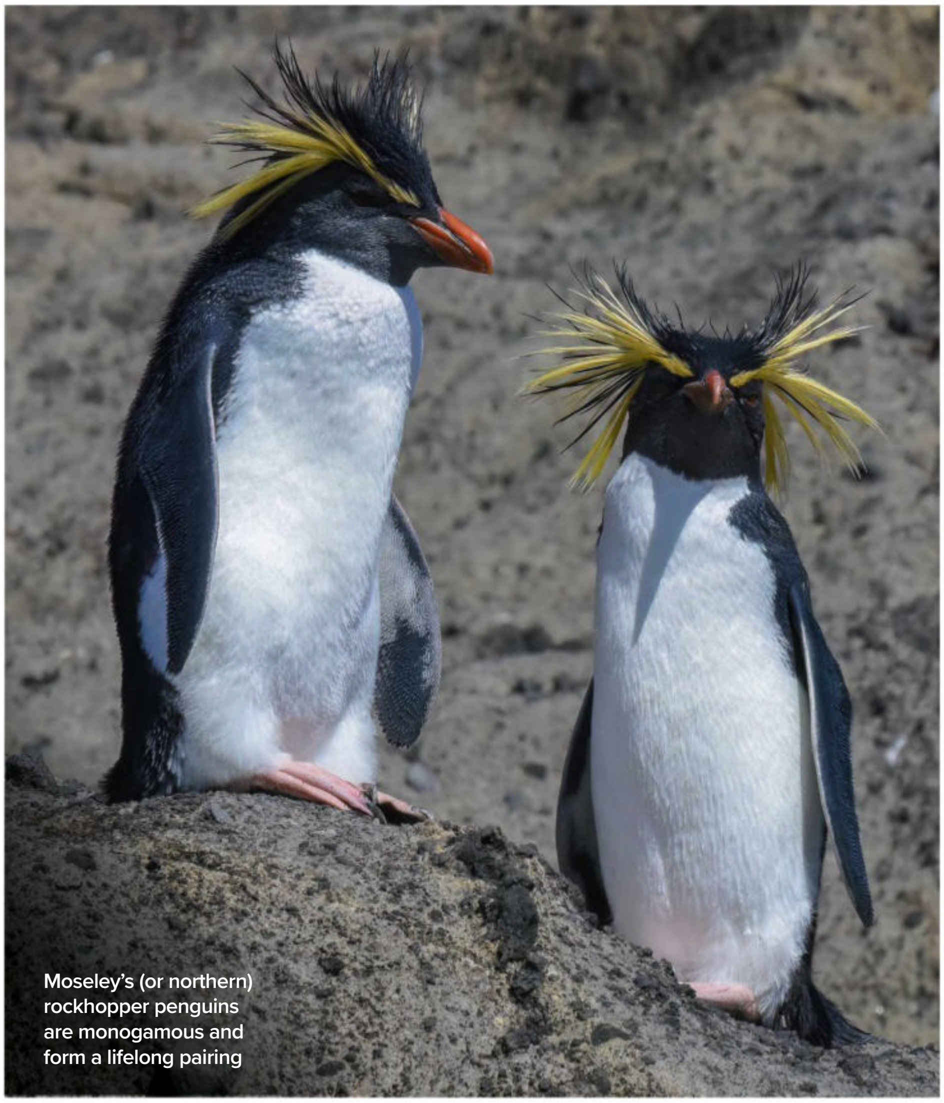
The number of Humboldt penguins has dramatically declined over the past 100 years. Traditionally this species nests in holes burrowed into a thick layer of guano (bird droppings) that covered rocks in its breeding grounds along the coast of Peru and northern Chile. But since the 1800s, much of this guano has been mined and shipped abroad as fertiliser, leaving only bare rock. Unable to burrow, the Humboldt's numbers have plummeted. So I was relieved when I spotted two Humboldt penguins on top of an island, amid a huge colony of Peruvian boobies.

Heading north to Ecuador, I similarly managed just a glimpse of the rare Galápagos penguin, listed as endangered by the IUCN, on the island of Fernandina, but had great views of a myriad of other wildlife, such as giant tortoises, marine iguanas, frigatebirds and boobies.

My next target group was crested penguins, made up of seven species, of which I still had five to see. As their name suggests, they all sport dynamic headwear, in varying shades of yellow. Many are found on remote subantarctic islands off New Zealand, which are surrounded by some of the roughest oceans in the world, and where visiting opportunities are limited.

In November 2018, I managed to secure a place on an annual expedition and, despite the choppy seas, got close enough to photograph the Snares penguin, endemic to the islands of the same name; the erect-crested penguin on both the Bounty and Antipodes archipelagos; and the royal penguin on Macquarie Island, where we were allowed to land. It was a relief to feel solid ground beneath my feet, and much easier to photograph my subjects. The royal penguin is virtually identical to the macaroni but with white cheeks instead of black. It is quite feisty and squabbles were breaking out in the surf, on the beach and at the densely packed breeding colony. Once hunted to make oil – yielding 500ml per bird – the royal is now thriving, with around 850,000 pairs.

The expedition returned to New Zealand's South Island, where I headed to the south-west coast to see another crested penguin, the Fiordland. This penguin, like the Snares, breeds in temperate rainforests, nesting among tree roots and rocks. Our 'walk' to reach them was not for the faint-hearted, as we slipped and slid our way down to the beach. The penguins use their strong claws to grip and there was a constant flow



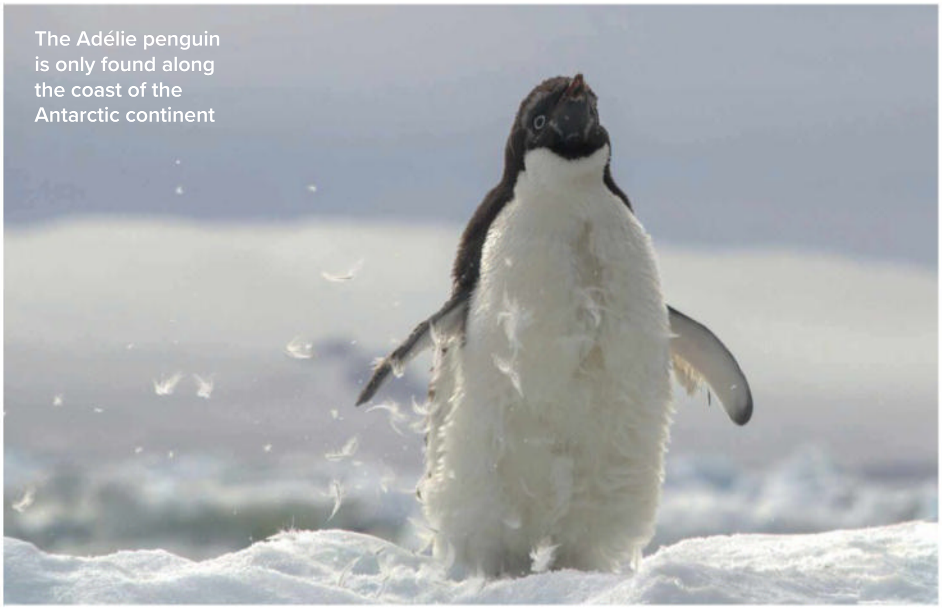
Moseley's (or northern) rockhopper penguins are monogamous and form a lifelong pairing

Emperor penguins travel constantly between the colony and the ocean

of birds travelling between the Tasman Sea and the colony. It was easy to see who was going where, as the birds coming from the sea to return to their chicks were pristine, whereas the ones leaving the colony were as muddy as we were.

By now I had seen 16 of the 18 species. The end was in sight. But the final two were more challenging than anticipated. About 90 per cent of Moseley's (or northern) rockhopper penguins breed at Tristan da Cunha, in the South Atlantic Ocean, the most remote inhabited archipelago in the world. There is no airstrip and it takes seven days to reach the islands by boat from South Africa.

This penguin has the longest and most flamboyant head plumes of all the crested penguins, and watching them blowing in the strong wind, as I struggled to hold my camera steady, was quite a spectacle. It's not just a pretty face, though: a Moseley's can dive to a depth of 100m in pursuit of prey, and is able to hold its breath for more than two minutes.



The Adélie penguin is only found along the coast of the Antarctic continent

When feathers fly

All birds moult their feathers and this is usually done a few at a time. But penguins must remain waterproof and once a year moult all their feathers at the same time, a process known as a 'catastrophic moult'. It takes two to four weeks and the birds must stay on land for the duration. They sometimes vigorously shake themselves to accelerate the process – as this Adélie is doing.

An emperor chick with both parents

> “Male emperor penguins huddle together in vast packs to incubate their single eggs during the winter”

The most challenging part of the trip was getting home again. We had left the UK on 28 February 2020, in the early stages of the Covid-19 outbreak. In the three weeks that we were away, the whole world changed. This left us at sea – quite literally, as South Africa had closed its ports. After our captain finally managed to negotiate entry to Cape Town, we flew home, straight into UK lockdown. At least I had plenty of time to sort my photographs.

I was scheduled to attempt completion of Mission Penguin that November, with a trip to Antarctica to seek out the most iconic of penguins, the emperor. Not only is this the largest penguin species, it is also the most southerly breeding, with the males incubating their single eggs throughout the bitter winter months, huddling together in vast packs on the ice for warmth.

DUE TO THE IMPACT OF THE virus, the trip was postponed for two years. When I finally set sail from the Argentine port of Ushuaia and reached Antarctica in November 2022, the weather deteriorated and it was looking unlikely that we would be able to launch the helicopters to reach the emperors.

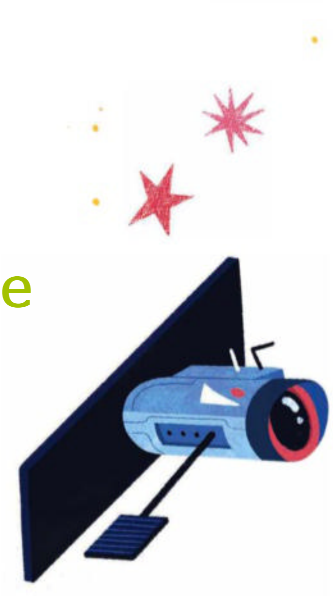
While I was thrilled to spot a distant emperor penguin on an ice floe and so complete Mission Penguin, it felt like an anti-climax. I went to bed dreaming of the spectacular colony that could have been. Miraculously, I awoke to a blue sky and calm sea – and the good news that the trip was back on. The sight was beyond anything I could have imagined, with hundreds of birds attending to their fluffy grey chicks. Tears streamed down my face. I had made it – Mission Penguin was truly accomplished.

Crossing the turbulent Drake Passage as we began the long journey home, I spent two quiet days in my cabin, reflecting on the past 10 years. What an amazing privilege to have shared my grief and experienced healing with these delightful creatures. It’s sad to think that future generations may not be so lucky, as penguins are seriously threatened by climate change, overfishing and coastal development. If we act now, we can all make a difference, so that others can experience the joy, and healing presence, of penguins.

“Satellites and space tech play a huge role in protecting the natural world”

Far above our heads, space technology is supporting conservation in exciting and vital ways

By **SIMON WARD** *Illustration by* **AMY GRIMES**



Animals don’t care much about satellites. The American elk doesn’t ponder orbital mechanics any more than the Eurasian brown bear contemplates the application of radar. What happens thousands of miles above their heads, in the infinite quiet of space, seems as far removed from their concerns as moon landings are from ant colonies.

But here’s the paradox: what happens in space matters deeply. Those tireless satellites, spinning around our planet at unimaginable speeds, are acting as guardians of some of its most vulnerable inhabitants. Whether tracking the migratory journeys of bar-tailed godwits, flying 29,000km without so much as a rest stop, or a tiger threading its way through fragmented forests in Asia, satellites are one of conservation’s sharpest tools – ever watchful, precise and unflinchingly reliable.

“Space technology gives us the ability to assess the health of forests, track deforestation, predict wildfires and measure the full extent of the human influence on landscapes and wildlife habitats,” explains Antoine Rostand, president and co-founder of satellite and enviro-intelligence firm Kayrros. “We can apply it anywhere on the planet and we can use it non-intrusively – there’s not always the need to put boots on the ground and disturb the environment to get a comprehensive read on local conditions.”

It’s a striking thought that, from an office in Paris, Rostand’s team can zoom down into the Amazon basin and pinpoint a single fire glowing beneath the dense canopy. A farmer’s controlled burn or the first flickers of illegal logging? The satellites hold the evidence and their findings ripple outwards, shaping decisions and ecosystems in ways that may echo for generations.

Satellites circle the Earth, capturing vital data. Key players include NASA’s Landsat series, the European Space Agency’s Sentinel missions and commercial platforms such as the Dove satellite constellation, run by satellite imagery company Planet Labs. Together, they provide high-resolution pictures and data critical for conservation. Many of these satellites operate in what’s known as low-Earth orbit, skimming between 500 and 1,200km above the surface of the planet. Others, such as the National Oceanic

ABOUT THE AUTHOR

Simon is a freelance writer specialising in sustainability, energy and technology. He explores how cutting-edge solutions, such as satellite technology, can drive positive change and improve lives.

> “Space tech is crucial to the fight against climate change and the despoliation of nature”

and Atmospheric Administration’s GOES satellites, monitor things further up in a geostationary orbit some 36,000km high. Matching the Earth’s rotational speed, they appear locked in place and can continually observe a given region.

Travelling faster than the speed of sound, these satellites capture landscapes using sensors that read light, heat and radar. Sentinel-1, for example, monitors deforestation, floods and ice loss with radar imaging, while Sentinel-2 deploys optical sensors to detect subtle shifts in vegetation health, land use and water quality.

Data streams back to Earth, decoded by ground stations and processed by AI. Machine learning algorithms sift through the imagery, identifying patterns and anomalies – a burned clearing, a wildlife corridor, an encroaching wildfire. They also ‘clean’ the data, refining it to remove unwanted detail such as clouds, smog, reflections and lightning storms.

“From the satellites that capture raw imagery to the observation tools that crunch the data, space tech plays a huge role in protecting the natural world,” says Rostand. “It’s crucial to the fight against climate change and the despoliation of nature.”

The tiger epitomises what’s at stake. There are fewer than 4,000 of these cats left in the wild, and their very survival depends on understanding their movements and habitats and protecting them from the many threats they face. Satellites offer a perspective impossible to achieve from the ground that reveals the balance between wilderness and encroaching human activity. Scientists can combine the incoming data from space with knowledge from the ground to map not just where tigers are today but where they might thrive tomorrow.

“We can see exactly where forests are shrinking, map corridors for safe movement and focus resources where they’re most needed,” says Rostand.

NASA in particular has played a major role in safeguarding tigers. Working with the Wildlife Conservation Society (WCS), the agency has developed tools that utilise data and imagery from satellites to help researchers monitor changes in tiger habitats, in near-real time. This approach has been instrumental in identifying ‘empty forests’ – areas of suitable habitat that currently lack tiger populations – and it has the potential to increase the land base for tigers by as much as 50 per cent, creating new opportunities for reintroduction and restoration.

The Human Footprint Index, built from satellite imagery, also plays a crucial role in these efforts. It overlays data on human density, road networks and railways to assess the impact of development across Asia. As Dale Miquelle of the WCS explains, the data not only highlights pressures on existing tiger populations but also guides conservationists to areas where reintroduction efforts could succeed.

These insights are contributing to the creation of Tiger Conservation Landscapes (TCLs) – regions identified as critical for tiger survival. Marked in dark orange on satellite-derived maps, TCLs represent 63 strongholds for tigers across Asia. These sites are not just priority areas for tigers, they’re hubs of biodiversity that also shelter myriad other species, provide ecosystem services to local communities and mitigate the impacts of climate change. Space tech, then, not only has the power to safeguard one species but can secure the future of ecosystems that sustain life across Asia.

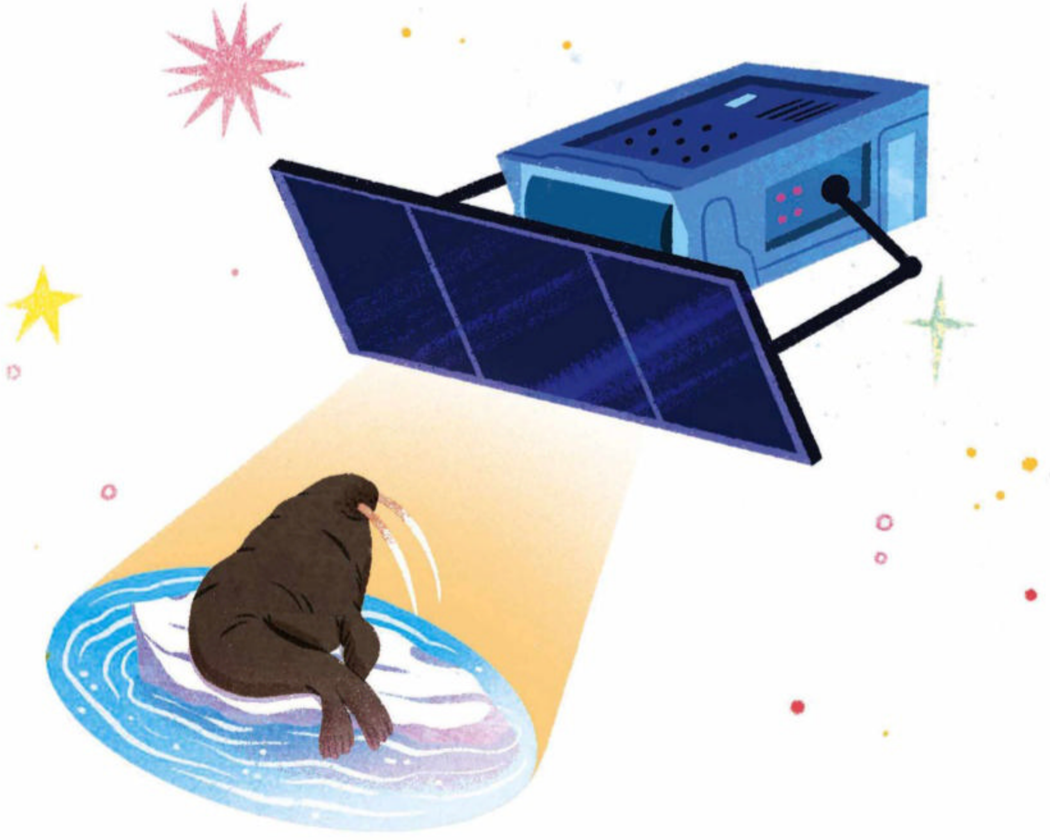
Yet satellites don’t just track wildlife. They can also shine an unforgiving light on our own human activity, whether it’s deforestation, the continuing urban sprawl or industrial pollution. They can reveal the full scale of our impact on the world around us. Nowhere is this more evident than in the Amazon rainforest.

Spanning nine countries and covering 5.5m km2, the Amazon is often (and rightly) referred to as the ‘lungs of the Earth’. Its health is vital to global biodiversity and carbon cycles.

Satellites can, if deployed, monitor the Amazon’s every breath: every acre burned, every illegal road carved through its woodland. “By bouncing signals off the forest canopy, satellites can measure the height of trees, detect illegal deforestation and gauge the progress of reforestation,” explains Bogdan Gogulan of NewSpace Capital, a firm of investors targeting spacetech with a green edge.

This is particularly important when we consider the need to accurately report forest-based carbon offsetting, green bonds or reforestation projects from companies. In order to challenge the under-reporting or exaggeration of green performance, you need verifiable, irrefutable data.

Gogulan also highlights the broader impact. “Satellites optimise transit and energy, which translates to lower emissions and less global warming. Inmarsat, a British satellite telecommunications company, has found that satellites are already lowering global carbon emissions by 1.5bn tonnes



Stats from space

12 million

hectares of tropical forest are lost every year, according to satellite data from The Global Forest Watch.

4,800km

is the distance travelled by migrating monarch butterflies, as discovered by satellite tracking.

4.9 million

barrels of crude oil leaked into the Gulf of Mexico in 2010 following the Deepwater Horizon oil spill.

11,000

'walrus detectives', across 68 countries, have reviewed images of the Arctic, providing scientists with vital data.

> "The project encourages volunteers to survey walrus populations using satellite imagery"

annually – equivalent to nearly four times the UK's emissions in 2021."

Yet even the brightest stars cast shadows, and satellites are no exception. While they peer at our ecosystems, their own existence is not without cost. The carbon footprint of launching an orbiting emissary into space, coupled with the energy demands of the sprawling data centres that store their findings, is a weighty contradiction. Every image of a shrinking rainforest, every glimmer of a methane plume, relies on a cascade of computational power, housed in structures that hum day and night. It's a reminder that even the tools of salvation have their price.

There are also considerations about tagging animals for tracking, which raises questions about their wellbeing, while financial and technical hurdles could potentially limit the use of advanced space tech in conservation for countries with fewer resources.

Critics have also pointed to the growing problem of space debris – the clutter of spent rocket stages and defunct satellites that are increasingly spiralling through the void. These relics of technological prowess threaten to collide with operational satellites, jeopardising the very systems we depend on.

BUT TO DISMISS THESE innovations outright would be to deny their potential. The industry is evolving, with companies designing smaller, more efficient satellites and adopting strategies to manage orbital traffic.

Satellites are becoming cheaper and smarter, with AI unlocking faster, deeper insights. As Amy Rosenthal of Planet Labs notes, "As the pace of change increases, better monitoring and understanding of our changing ecosystems are crucial. There's a significant role for satellites to track these changes, develop solutions to stem further biodiversity loss and support restoration efforts."

Initiatives such as Planet Labs' Project Centinela provide high-resolution imagery of biodiversity hotspots, helping conservationists prioritise efforts in the most critical areas. "We now have the increased capabilities and responsibility to make planetary changes visible, accessible and actionable," adds Rosenthal.

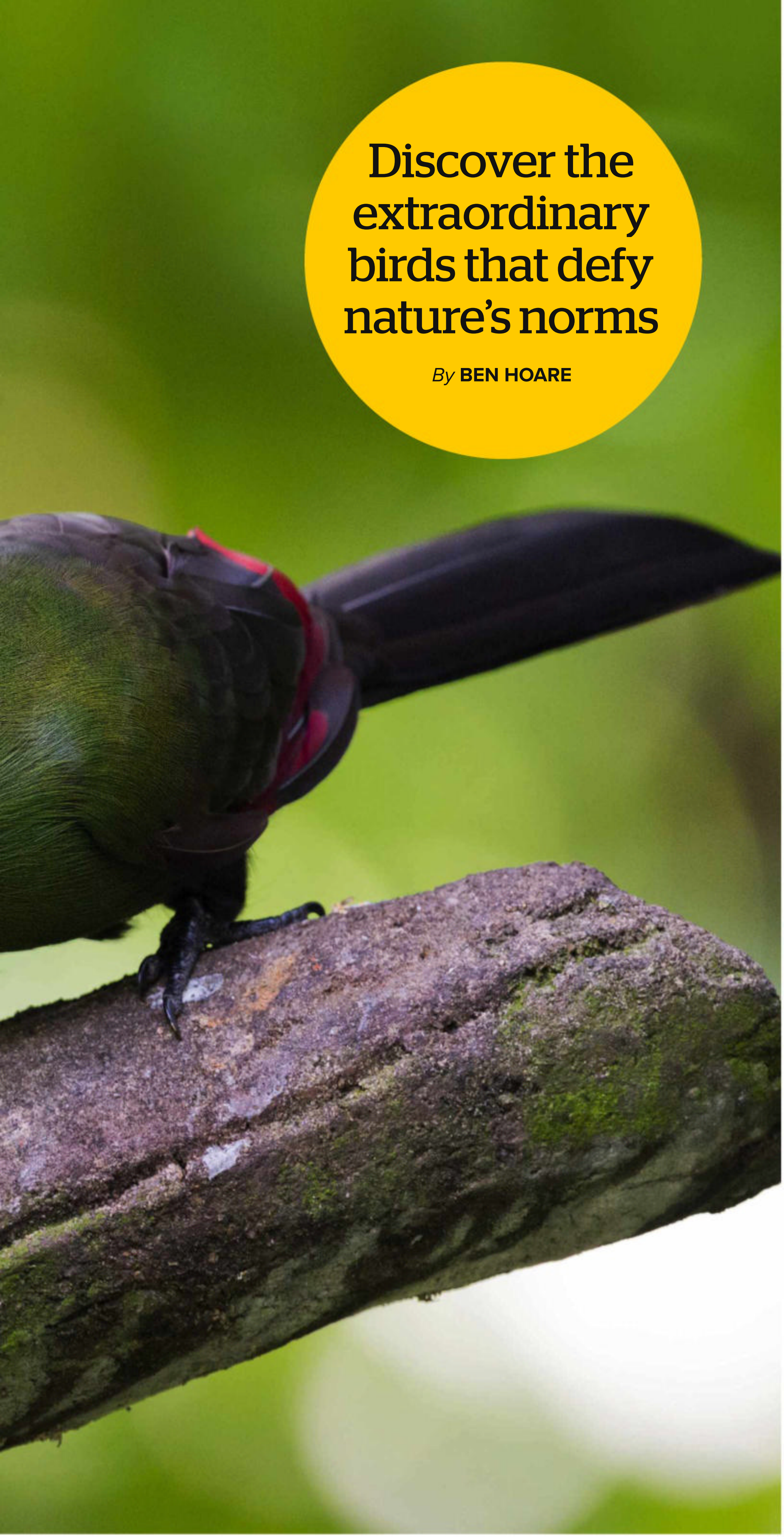
Rod Downie, interim director of science at WWF-UK, also explains how satellite-led insights are engaging the public on conservation. In the Arctic, Downie and his team are developing a better understanding of where walruses haul-out on land in the context of rapid warming and declining sea ice. The Walrus from Space citizen science project encourages volunteers to survey walrus populations using satellite imagery, which contributes to research on the effects of climate change.

'Walrus detectives' search for, and count, walruses in thousands of satellite images collected by space technology. The benefit of this approach is that it's non-invasive and does not disturb the animals. Besides, few volunteers, no matter how willing, would be able to get themselves to the remote reaches of the Arctic.

Satellites have become indispensable allies in the fight to save Earth's biodiversity, humming with purpose in the infinite quiet of space. Yet, as Rosenthal says, space technology is just the tool – it is our responsibility to act. Satellites offer us a view and, with it, a choice: to save what is irreplaceable or to look away. As the godwit flies and the tiger prowls, the question is whether we, their stewards, will rise to the occasion.

Livingstone's turaco is one of Africa's most spectacular forest birds

BIRDS THAT BREAK THE RULES



Discover the extraordinary birds that defy nature's norms

By **BEN HOARE**

Despite their vivid colours, turacos are hard to spot in treetops

The bird with metal in its feathers

Livingstone's turaco

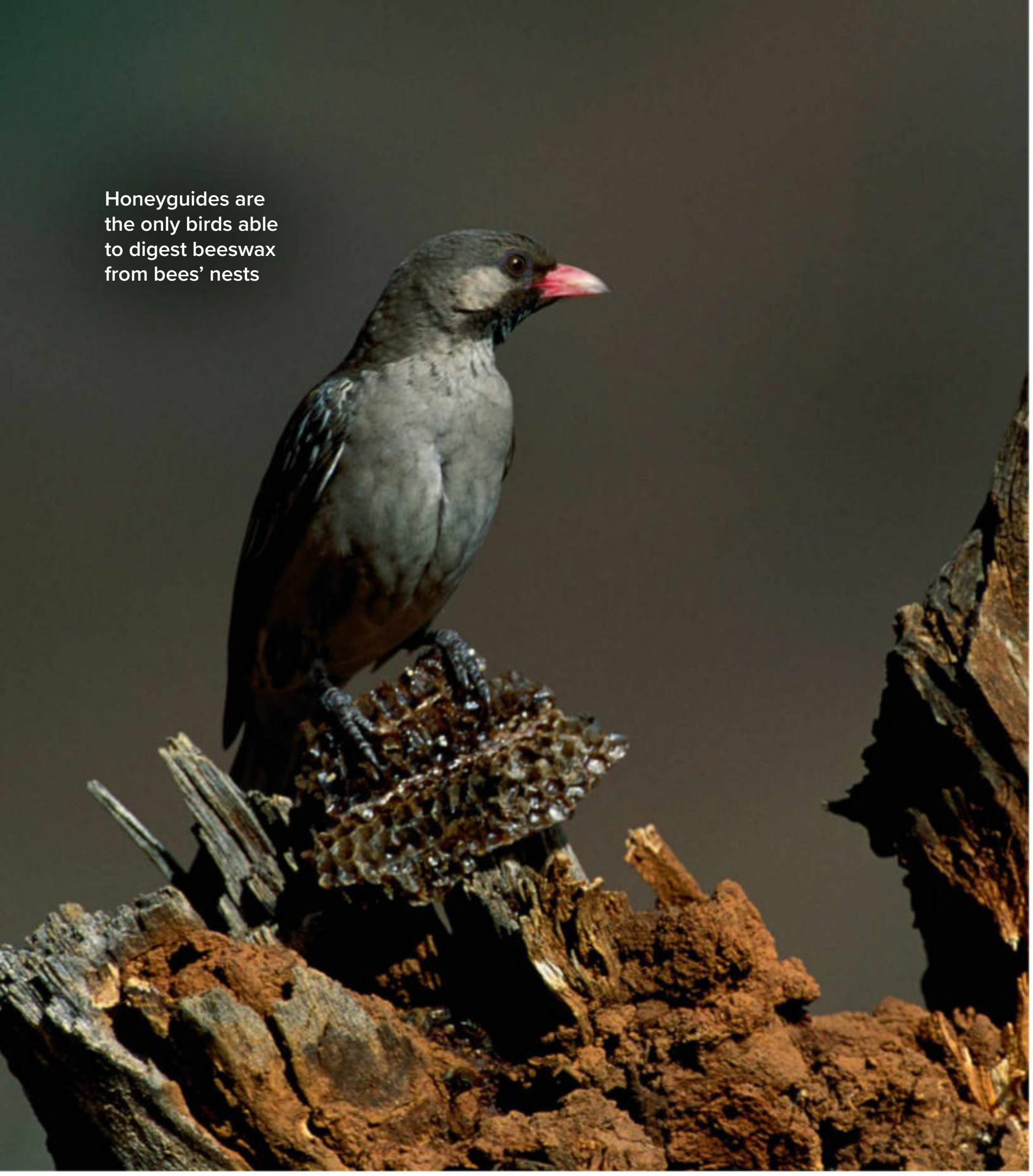
Tauraco livingstonii

Many birds have fabulous plumage to attract mates or send warning messages. Some of the colours in their feathers are produced by microscopic structures on the feather surface that absorb and reflect light in a certain way. These are known as structural colours. Other colours are produced by pigments, dye-like substances that occur widely in nature. Birds may make their own pigments or obtain them from their food. But the green and red pigments in turaco feathers are wholly unique. And the secret ingredient is… copper.

Turacos are a family of pigeon-sized birds from African forests that adore fruit – a diet that happens to be rich in copper. The metal is taken up by their bodies and helps to form two dazzling pigments not found in any other bird, or indeed any other animal. Turacoverdin creates vivid green feathers, while turacin turns them red. It was once estimated that an adult turaco would take around three months to eat enough fruit to produce its gorgeous coloration. The more it eats, the brighter its plumage.

Turacos have another claim to fame. They're the world's only truly green birds. Parrots and many other species may appear green but aren't really. The green in their feathers is structural, so is a sort of optical illusion, unlike the chemical, turacoverdin-based pigment in turacos.

SINGLE TURACO: KS KONG/GETTY; PAIR OF TURACOS: JURGEN & CHRISTINE SOHNS/GETTY



Honeyguides are the only birds able to digest beeswax from bees' nests

The bird that asks us for help

Greater honeyguide *Indicator indicator*

Pet parrots have been known to ask their owners for things. Alex, the African grey parrot who lived with the scientist Irene Pepperberg and contributed much to our understanding of avian intelligence, would request cuddles. In the wild such interactions are extremely rare. In fact, only one wild bird actively solicits our help – the greater honeyguide.

The behaviour does not occur throughout the honeyguide's African range. But in parts of Kenya, Tanzania and Mozambique, it forms a partnership with humans in which both parties benefit. The little brown bird feeds on wild honeybee nests – in particular, the larvae and waxy structure. The problem is, bees' nests are sturdy and well defended. So the honeyguide asks for assistance. Having found a nest in a tree, it uses a squeaky call to attract the attention of people nearby, then repeatedly flies a short way and calls again, guiding its helpers to the nest like a feathery satnav. The human honey hunters climb the tree and soon are sharing the spoils with their guide.

A brilliant piece of research by ornithologist Clare Spottiswoode discovered that when people whistle to the honeyguide, it also understands them and flies over. It's a two-way conversation. People from different tribes use different calls, and honeyguides are more likely to respond to those of their local honey hunters than the unfamiliar calls of people from further afield.

ABOUT THE AUTHOR

Former *BBC Wildlife* staffer Ben is a best-selling wildlife writer and all-round nature nerd. His most recent children's books include *An Anthology of Exquisite Birds* (DK, £20).

HONEYGUIDE: IMAGEBROKER.COM GMBH & CO KG/ALAMY

The bird that sings upside-down

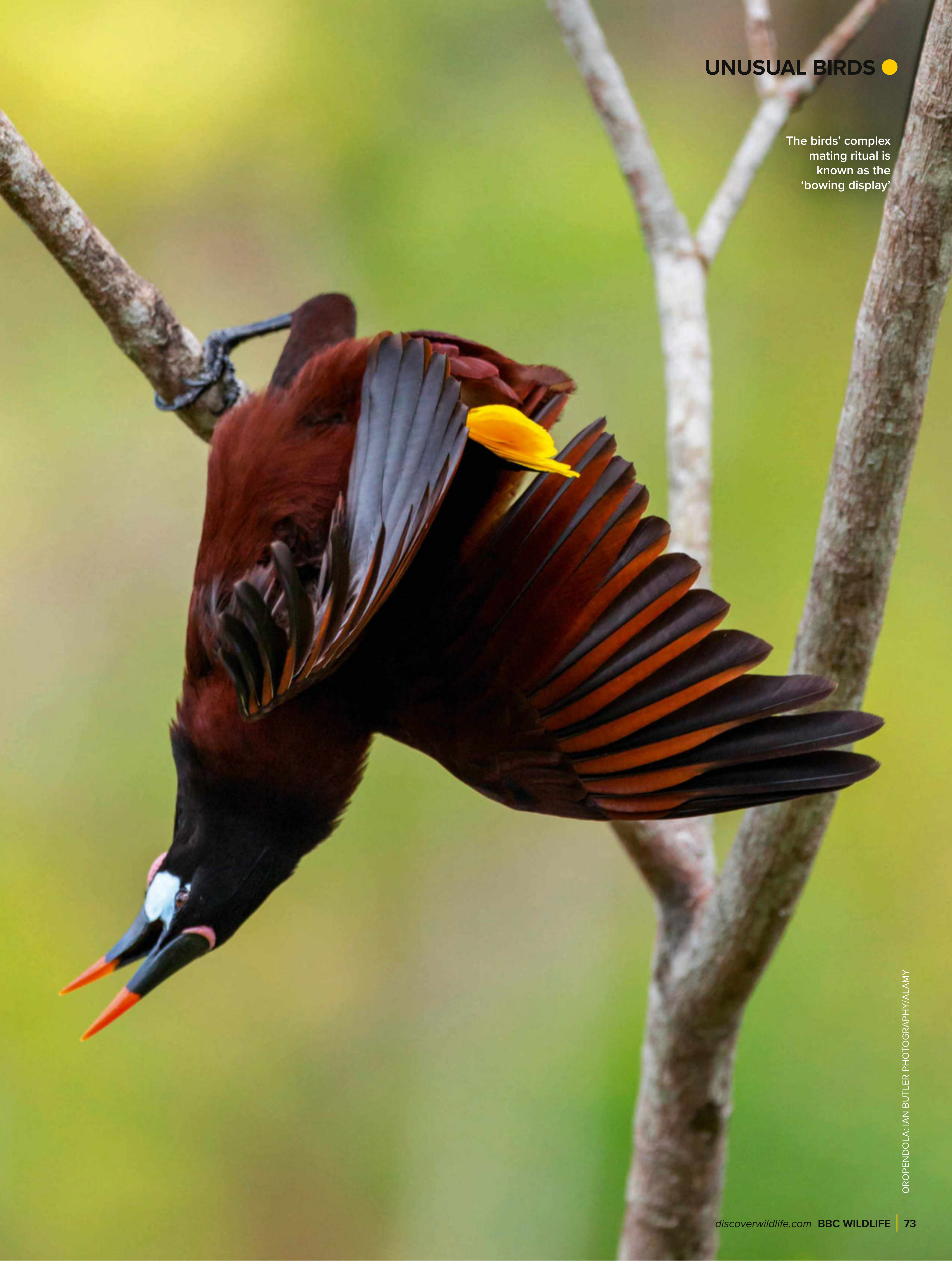
Montezuma oropendola

Psarocolius montezuma

One of the most bizarre bird songs on the planet rings out through the forests and fruit plantations of Central America. It belongs to the male Montezuma oropendola, which produces a torrent of rattles and gurgles with a strangely metallic quality. But that's not the only remarkable thing about it. The oropendola also likes to sing upside-down, while swinging energetically under his perch like an avian trapeze artist, which no doubt enhances the impact of his singing and helps him attract a mate.

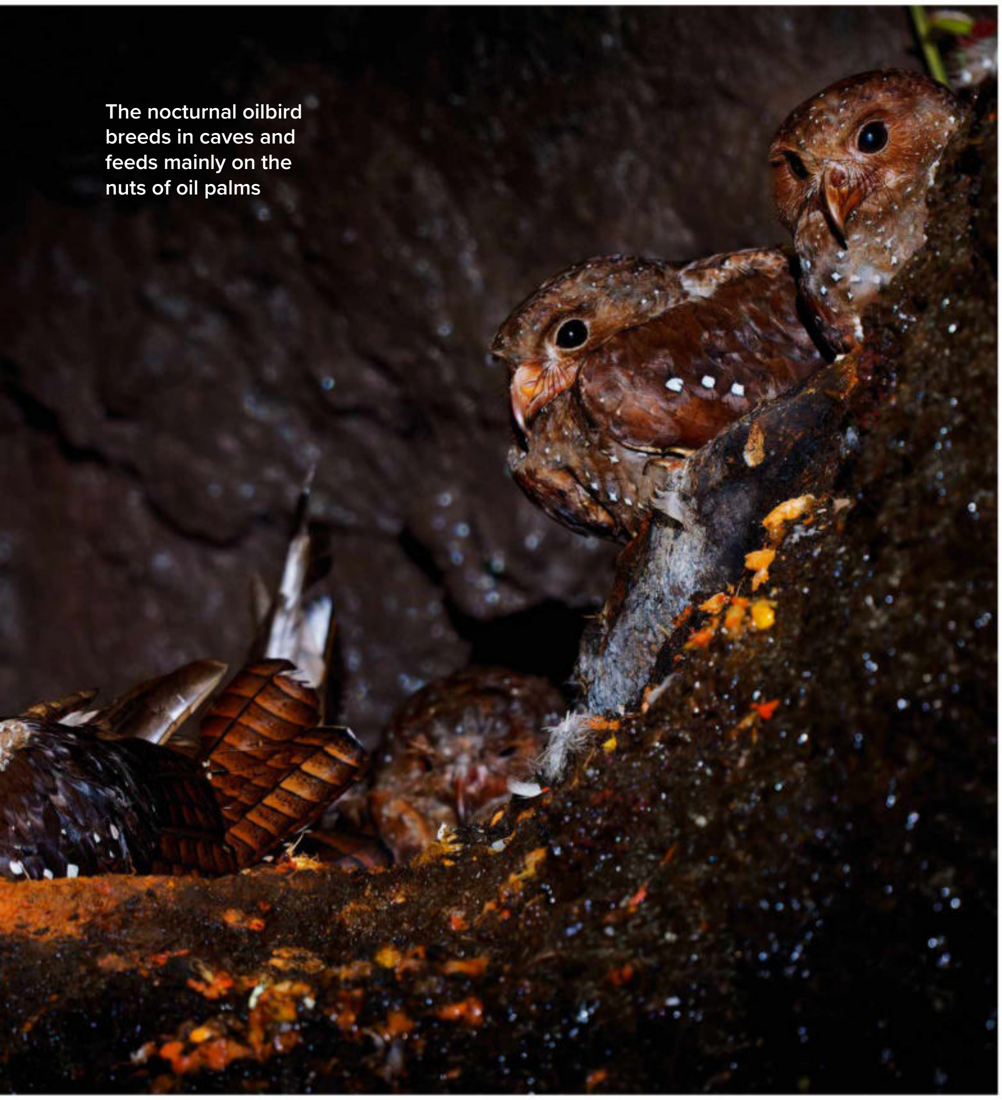
There are other birds that hang upside-down to display to would-be partners, including several birds of paradise. But their songs are mostly croaks and can't compete with the oropendola's virtuoso vocals.

Another of the Montezuma oropendola's curious habits is that the species often nests close to colonies of warrior wasps. You might think this unwise but the aggressive wasps do the oropendola a favour by acting as a deterrent to parasitic botflies, whose larvae would otherwise feed on its helpless chicks.



The birds' complex mating ritual is known as the 'bowing display'

OROPENDOLA: IAN BUTLER PHOTOGRAPHY/ALAMY



The nocturnal oilbird breeds in caves and feeds mainly on the nuts of oil palms

The bird that flies in the dark

Oilbird

Steatornis caripensis

Flying in total darkness would be potentially fatal for most birds. But there are a handful that fly with confidence in pitch-black conditions, because they can navigate their surroundings by echolocation. South America's oilbird is the best-studied. Like bats, it produces clicks and listens for the returning echoes to build up a detailed picture of its surroundings. It 'sees' with sound.

The oilbird resembles a cross between a hawk and a nightjar, with a hooked beak, big eyes, oval nostrils, white-spotted plumage and walrus-style moustache. It eats fruit and its chicks are so plump that people used to harvest them for their copious oil. Thanks to this unique combination of features, ornithologists have placed the species in its own taxonomic group, the order Steatornithiformes.

A colonial breeder, the oilbird nests in rainforest caves, where large numbers of the birds flap around without ever colliding. The cacophony of ear-piercing shrieks they make has earned them the local name *guácharos*, meaning 'one who cries and laments'. Mingling with these harsh calls is the constant stream of clicks with which the birds echolocate. Since the clicks are deeper in pitch than those of bats, they are easily audible to human ears.

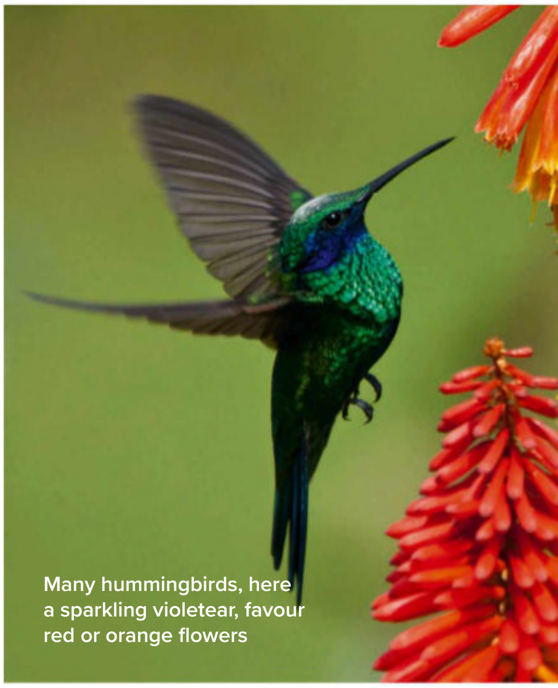
The bird that flies backwards

Hummingbirds *Family Trochilidae*

Everything about hummingbird flight is a marvel. These dazzling sprites zip through the air at around 50kph, their wings beating 40-80 times a second. And that is just flying normally. During courtship displays, some species accelerate to 80kph, powered by 200 wing beats a second. Meanwhile, their tiny heart is pumping up to 20 times a second, roughly twice as fast as in many flying birds.

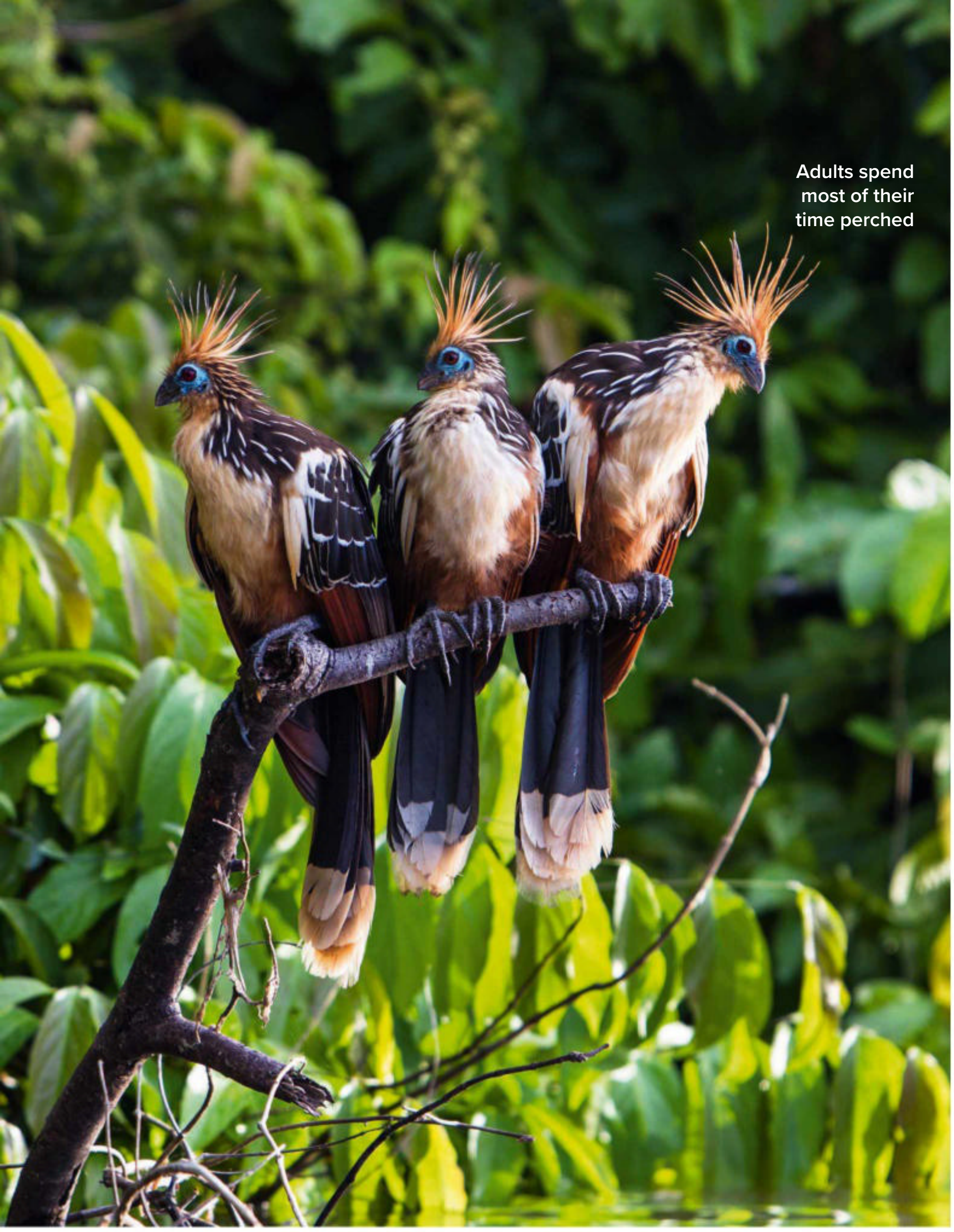
Hummingbirds owe their aerial prowess to the way in which they move their wings. All other birds flap their wings using an up–down motion. But hummingbirds rotate them, moving each wing through a complete circle by twisting the humerus bone near the shoulder joint. This is closer to how insects do it than typical birds. As a result, hummingbirds generate lift during the upstroke as well as the downstroke, rather than only when flapping down like in other birds. Hummingbirds can also hover beautifully and fly upside-down, sideways and even backwards. Other birds may pull off some of these manoeuvres but not as elegantly – and none can fly backwards properly.

Such phenomenal athleticism is made possible by feeding on masses of sugary flower nectar and frequent refuelling. 'Hummers' consume at least half their body weight in sugar every day – and often far more. They hover at flowers to feed, which is much faster than having to land first. It also means they can access flowers out of reach to less agile birds.



Many hummingbirds, here a sparkling violetear, favour red or orange flowers

OILBIRD: PHOTOTRIP/ALAMY; HUMMINGBIRD: PRISCILLA BURCHER/GETTY



Adults spend most of their time perched

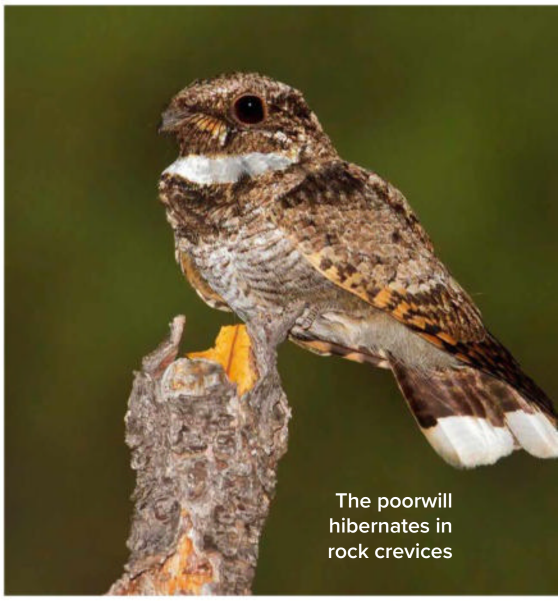
The bird that behaves like a cow

Hoatzin *Opisthocomus hoazin*

THE AMAZON’S SWAMPS ARE home to a bird so strange there’s nothing else like it alive today. It can barely walk, sports a mohican crest and, when young, has claws on its wings, which it uses as grappling hooks to clamber up trees. Meet the hoatzin, an ungainly oddball that bears more than a passing resemblance to bird-like dinosaurs from the late Jurassic period.

Weirdest of all, the hoatzin eats leaves. Leaf-eating is not as straightforward as it sounds, because leaves are full of difficult-to-digest cellulose and laden with toxins. What’s more, they are poor in nutrients, so you need to consume a lot of them. To succeed, the hoatzin has evolved its own version of the foregut fermentation system seen in cattle, where plant material is broken down by passing through a series of chambers packed with friendly bacteria. It has become a cow with feathers.

Much of the magic takes place in the crop. Every bird has one – it’s a food storage pouch near the throat. But the hoatzin’s crop is enormous, so it can process large quantities of leaves, with a ridged inner surface to grind them down. This is a slow process, taking up to two days. So bloated it can hardly take off, the hoatzin is prone to monster burps and produces droppings that reek of cow dung. No wonder locals call it the ‘stink bird’.



The poorwill hibernates in rock crevices

The bird that hibernates

Common poorwill

Phalaenoptilus nuttallii

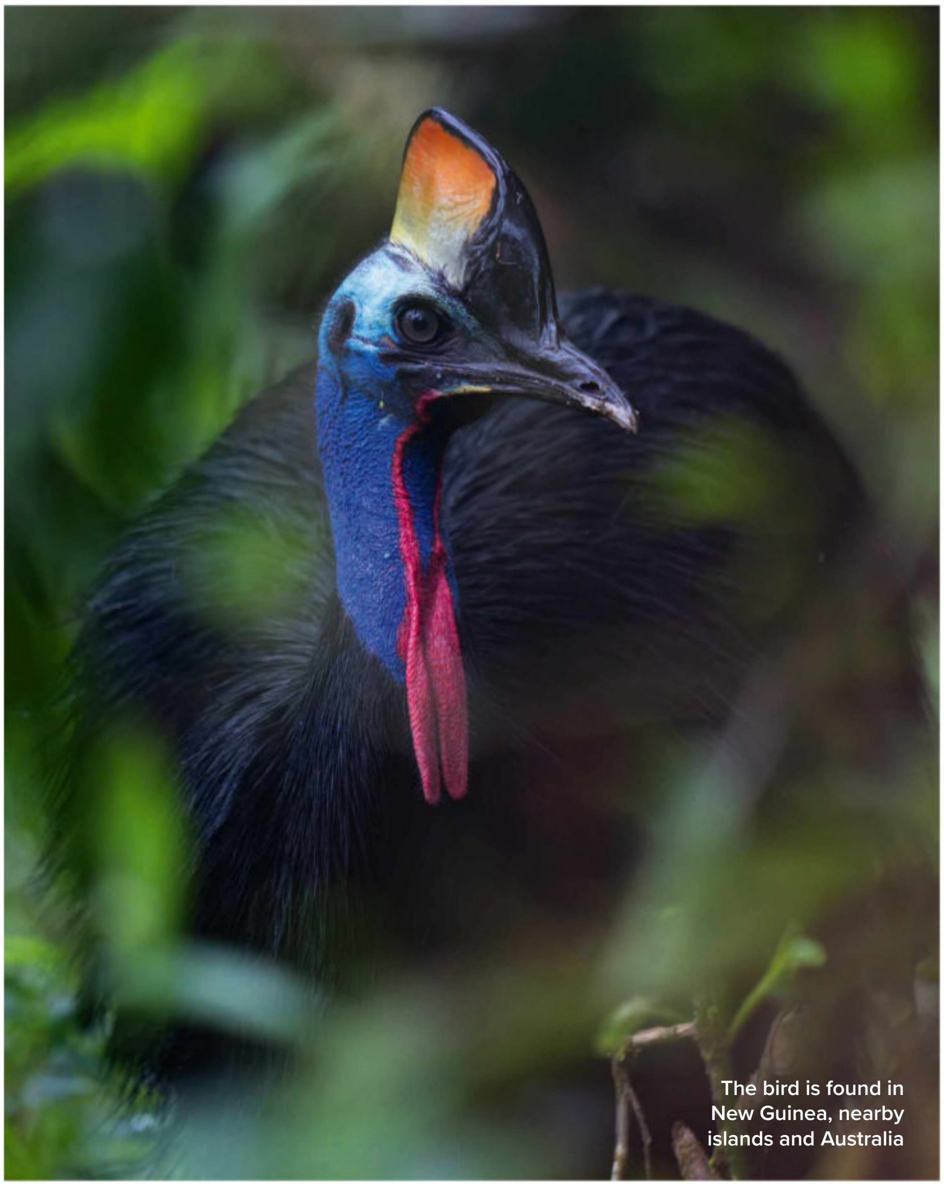
HIBERNATION OF ONE FORM or another is widespread in the animal kingdom. When the going gets tough, many reptiles, amphibians, mammals and insects opt to zone out until things improve. By slowing their metabolism, they save large amounts of energy and are able to live off their reserves for several months. Yet the common poorwill is the only species of bird that hibernates.

A member of the nightjar family, the poorwill is a beautiful bird that swoops about after dark to catch moths and beetles, much like a nocturnal swallow. It breeds in western North America, where this food source disappears at the end of summer. So, like real swallows, it migrates south for the winter. But some of the poorwill population stays behind. These individuals hide among rocks and allow their body temperature to fall to 5°C, while their oxygen intake plunges by 90 per cent. They remain dormant, camouflaged by their plumage, until spring returns.

Swifts and hummingbirds can also chill themselves and enter a resting state called torpor. However, this is a standby mode, rather than long-term hibernation. Usually the birds do it overnight or during cold, wet weather. It’s a temporary fix that allows swift nestlings to go without food for 48 hours until their parents return from a foraging trip, and enables small hummingbirds with limited fat reserves to survive freezing nights high in the Andes mountains.

HOATZIN: KONRAD WOTHE/NATUREPL.COM; POORWILL: ALL CANADA PHOTOS/ALAMY

The southern cassowary can reach almost 1.5m


The bird is found in New Guinea, nearby islands and Australia

The bird that kicks humans to death

Southern cassowary

Casuarius casuarius

As a rule, birds are not considered a threat to human life. Yet there are cases of birds harming people and, on rare occasions, killing them. Terns dive-bomb people who get too close to their nests, sometimes drawing blood with their beaks. Eagles and owls also tackle nest intruders, attacking with outstretched talons. British photographer Eric Hosking lost an eye to a tawny owl this way in 1937.

The only birds known for sure to have killed humans are mute swans, ostriches and cassowaries, all of which will defend their eggs and young fiercely. The most recent confirmed mute swan attack was in Chicago, USA, in 2012, when a kayaker drowned after a bird knocked him into the water. Ostriches can kill with a ferocious kick from their powerful back legs, which have long claws capable of disembowelling a person.

But the most dangerous bird in the wild today? That's probably the southern cassowary. This flightless giant has huge back legs armed with dagger-like claws that can reach 12cm long. In 1926, a cassowary kicked a boy to death in Queensland, Australia. Fortunately, there have been no recorded deaths caused by cassowaries since then.

CASSOWARY ON BEACH: BLICKWINKEL/ALAMY; CASSOWARY PORTRAIT: STAFFAN WIDSTRAND/NATUREPL.COM

GREAT FRIGATEBIRD: KEVIN SCHAFER/ALAMY;

The bird that sleeps in the sky

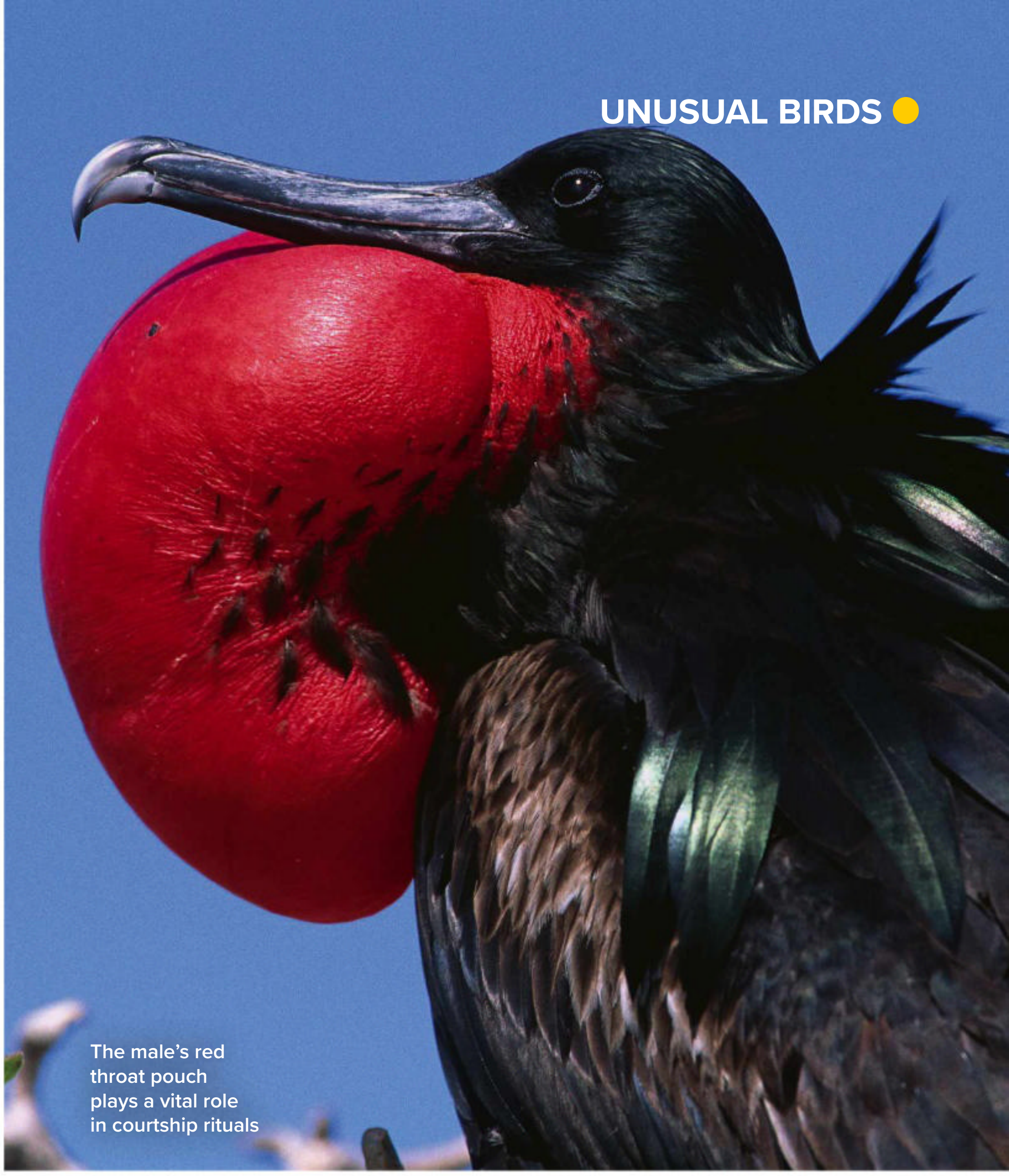
Great frigatebird

Fregata minor

Over the past couple of decades there has been a lot of groundbreaking research into how animals sleep. One startling discovery is that chinstrap penguins take up to 10,000 micro-naps a day. Another stunning finding is that birds are able to sleep while flying.

Research by the Max Planck Institute for Ornithology, published in 2016, showed how great frigatebirds nap while airborne. These seabirds lack waterproof plumage and can't afford to land on the water, yet stay at sea for weeks on end. Data recorders fitted to the frigatebirds demonstrated that when flying over the sea the birds usually rested half of their brain at a time, so could stay alert and see where they where going. But occasionally, they shut down both brain hemispheres for several seconds.

So far, mid-air sleep has only been proved in frigatebirds but it might be more widespread. Given that alpine and common swifts stay in the air for many months without landing, it seems probable that these birds can also sleep in the sky.



The male's red throat pouch plays a vital role in courtship rituals

This massive vulture inhabits central Asia and eastern Africa

The bird that survives on bone

Bearded vulture

Gypaetus barbatus

Osteophagia, or bone-eating, is not for the faint-hearted. Hyenas and other carnivores will occasionally chew on a bone. A range of herbivores, including giraffes, do too, gnawing bones to obtain valuable calcium and phosphorus lacking in their plant-based diet.

But actually surviving on bone? Among vertebrates, there's just one specialist bone-eater – the bearded vulture. Incredibly, bone makes up as much as 90 per cent of this bird's food. Researchers discovered that, given the choice, it invariably chooses bone over juicy flesh. So how can a huge vulture – they are frequently over 1m long, with a wingspan of nearly 3m – survive on stuff as hard and unappetising as this?

Well, bone is surprisingly nutritious. A 2017 study found that fresh bone contains 8 per cent more energy than fresh meat. Even dry, old bones – which the bearded vulture prefers, possibly because they are lighter and easier to carry – are still full of protein. The bone marrow, the soft fatty substance inside bones, is particularly sought-after.

But there is, of course, a hitch: digesting it. To get the job done, the bearded vulture has ultra-acidic stomach juices, which have a pH of about 0.7 – virtually neat acid. And its thick stomach lining offers protection against lethally sharp bony fragments. Small bones it swallows whole. Larger ones – a lamb's femur, say – call for a different technique. The birds are able to carry bones that weigh half as much as they do, and use thermals to lift them high in the air, before dropping them on rocks to smash them to bits. In Spain, the bird is known as *quebrantahuesos* – bone-breaker.

FRIGATEBIRD: KEVIN SCHAFER/ALAMY; VULTURE: EDUCATION IMAGES/GETTY

Q&A

With Stuart Blackman

Email your questions to wildlifemagazine@ourmedia.co.uk

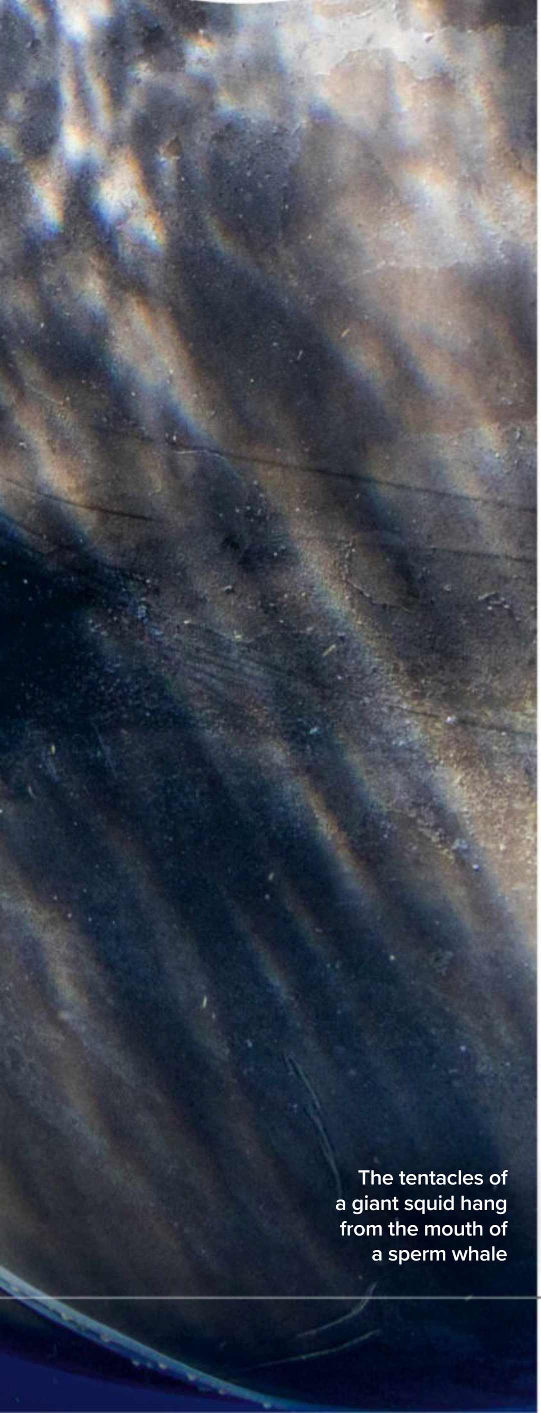
What is blubber?

Blubber is a wobbly sort of word, perfect for describing the thick layer of fat cells that lies under the skin of whales, seals, penguins, manatees and other marine animals. Terrestrial animals keep out the cold with fur or feathers, which trap a layer of warm air against the skin. In water, though, the pressure forces out the air.

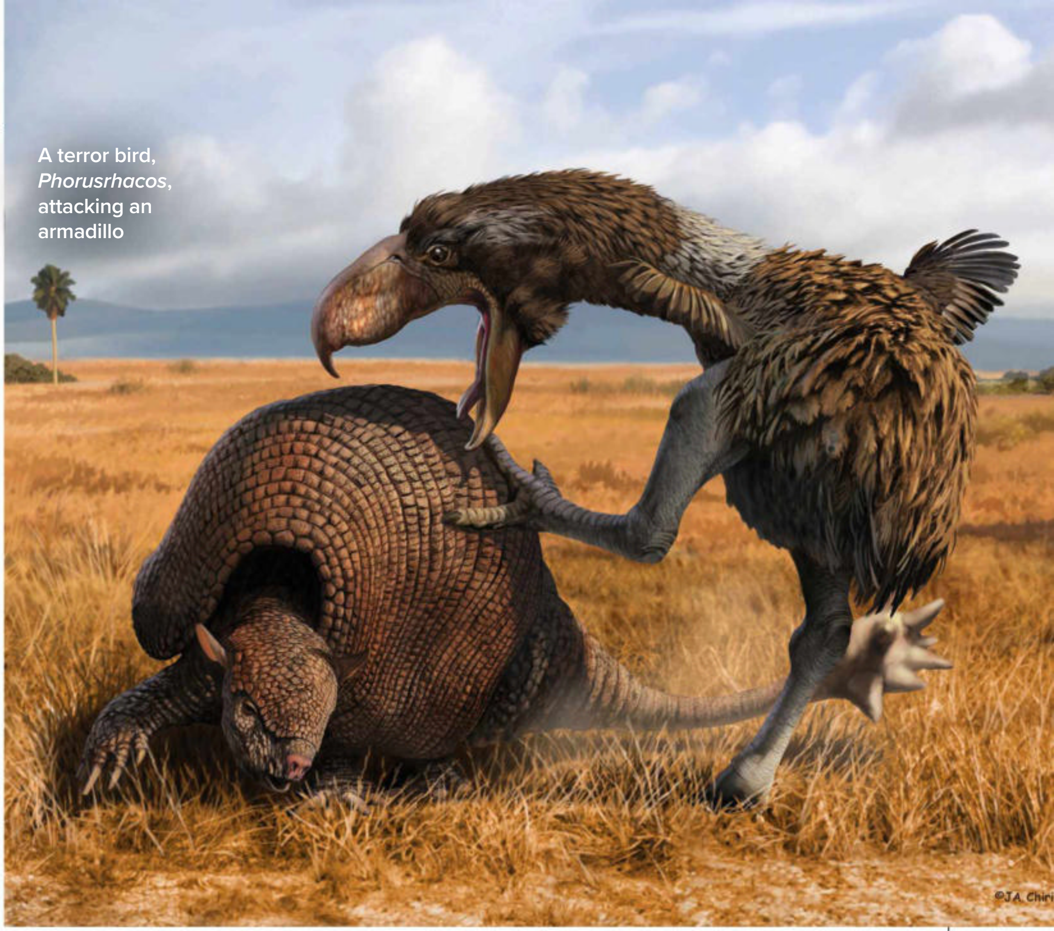
Theoretically, a furry marine animal could trap a layer of warm water but that would require much more energy to heat compared to the same volume of air. So marine animals shroud themselves in a layer of insulating fat instead. Not only does blubber keep the warmth in, it also serves as a store of energy and a buoyancy aid.

Unfortunately for whales, blubber has had its uses for humans, too. In the days before fossil fuels, much of our lighting and heating was fuelled by blubber-derived whale oil. It has been argued that the advent of fossil fuels was the beginning of the end for the whaling industry. But others maintain that the appearance of fossil fuel-powered whaling vessels only made things worse.

Mature female sperm whale in the Caribbean Sea, Dominica



The tentacles of a giant squid hang from the mouth of a sperm whale



A terror bird, *Phorusrhacos*, attacking an armadillo

What were terror birds?

A QUICK LOOK AT THE SKELETON OF a terror bird – standing up to 3m tall and topped with a mighty beak that looks like it was built for slicing through girders – will leave nobody wondering how they got their name. Skeletons are all that remain of these giant, flightless, walking bolt cutters, which stalked South America for 45 million years, until they disappeared about 100,000 years ago. They are not the biggest birds ever to have existed – that title probably goes to the elephant birds of Madagascar or the moas of New Zealand, extinct relatives of ostriches and emus. While terror birds bear a superficial similarity to this group, their closest living relatives are, in fact, two species of seriema, crane-like predatory birds from South America.

"Half the skull was made up of a hefty beak with a vicious hook"

Terror birds, like seriemas, were almost certainly carnivorous. Perhaps the biggest of them all, *Kelenken guillermoi*, a species unearthed in Argentina, wielded a 72cm-long skull (the biggest of any bird, past or present), of which more than half was made up of a hefty beak with a vicious hook at the tip. It's not entirely clear how they wielded these enormous protuberances. They may have used them to kill prey and tear off manageable hunks of flesh and bone in the manner of modern-day raptors. But terror birds' beaks are remarkably narrow considering their spectacular length and depth. An analysis of their mechanical properties suggests that, while they would have been able to deliver a powerful bite, they were far more fragile in the face of sideways forces.

This has seeded the idea that the birds used their beaks as daggers, immobilising prey with repeated downward stabs. Another possibility is that they specialised in chasing down smaller prey that could be swallowed whole. Either way, they were probably very fast over the ground. Based on anatomical evidence, one species, *Mesembriornis milneedwardsi*, might have reached 97kph, which is up there with a cheetah.

Biologists have long wondered whether the last of the terror birds would have crossed paths with the earliest humans. Indeed, some have argued that humans hunted them to extinction but, as more fossils are found, it is becoming clear that most of them disappeared before humans arrived in the Americas. A more likely scenario is that they were driven to extinction by competition with large carnivorous mammals, such as dogs, cats and bears, which migrated south from North America when the land bridge between the two continents appeared 2.5 million years ago.

WHALE AND SQUID: FRANCO BANFI/NATUREPL.COM; SPERM WHALE: TONY WU/NATUREPL.COM; TERROR BIRD: JA CHIRINOS/SCIENCE PHOTO LIBRARY

Black kites fly over a bushfire in Australia's Northern Territory

Whistling kites are drawn to fires

Can any animals survive a fire?

NATURE HASN'T (YET?) COME UP WITH a way to make animals fireproof. As a rule, their only option is to run, crawl, fly, hop, slither or burrow to safety. However, some animals can survive closer encounters with an inferno than others.

The short-beaked echidna, a spiny, egg-laying relative of the platypus, seems to have an unusually high survival rate, even if it fails to outpace the advancing flames. When a fire swept through echidna habitat near Perth in Western Australia in 2015, four out of five tagged individuals survived, apparently by sheltering in hollow logs. Immediately after the fire had passed, the animals entered a state of torpor, reducing their body temperature and activity levels for a few weeks, until the insects they feed on started returning to the area.

Some animals, including more than 200 species of insect, are actively attracted to fire. One of those is the black fire beetle, a type of jewel beetle widespread across Europe, Asia and North America that lays its eggs in freshly charred wood and seeks out wildfires using specialised sense organs that are sensitive to infra-red radiation. The species often arrives en masse while a wildfire is still burning and has been observed running over surfaces that are too hot to touch. They are also attracted by the flames and heat produced by oil refineries, smelter plants and wood burners. Another so-called 'pyrophile' is a ground beetle called *Sericoda obsoleta*. During a wildfire in Canada, huge numbers descended from the smoke-filled sky and crawled into firefighters' clothing.

Then there are smoke flies. These tiny insects, just a couple of millimetres long, were thought to be vanishingly rare until they were observed swarming in a plume of smoke rising from a smouldering heath fire in England in the early 20th century. Smoke fly biology remains poorly understood but it seems that they use the plumes, where temperatures can reach 65°C, as a mating arena.

There are avian pyrophiles, too. In Australia, at least three species of raptor – black kite, whistling kite and brown hawk – have come to be known as firehawks due to their habit of patrolling the edges of advancing bushfires and pouncing on small mammals and reptiles fleeing the flames. However, firehawks apparently go further than that. Observations by firefighters and aboriginal people suggest that the birds seed new fires by picking up burning sticks in their talons or beak and transporting them to other areas. It has even been suggested that aboriginal Australians, who have long used controlled burning to encourage colonisation by favoured food species, learned these techniques by watching the firehawks.

> "Some raptors patrol the edges of bushfires"

RECORD BREAKER!

What is the largest snail?

Among terrestrial species, that title would go to one of several closely related species of giant African land snail. According to Guinness World Records, the record holder, with a shell measured in 1978 at 27.3 cm long, was named Gee Geronimo and kept as a pet in West Sussex. Some marine snails can grow bigger than that, though. Australian trumpet shells can reach 72.2cm in length and weigh as much as an average three-year-old human. Some fossil ammonites exceeded 2m in diameter but, being more closely related to octopuses and squid, they don't really count as snails.

The giant African land snail, the largest known terrestrial gastropod

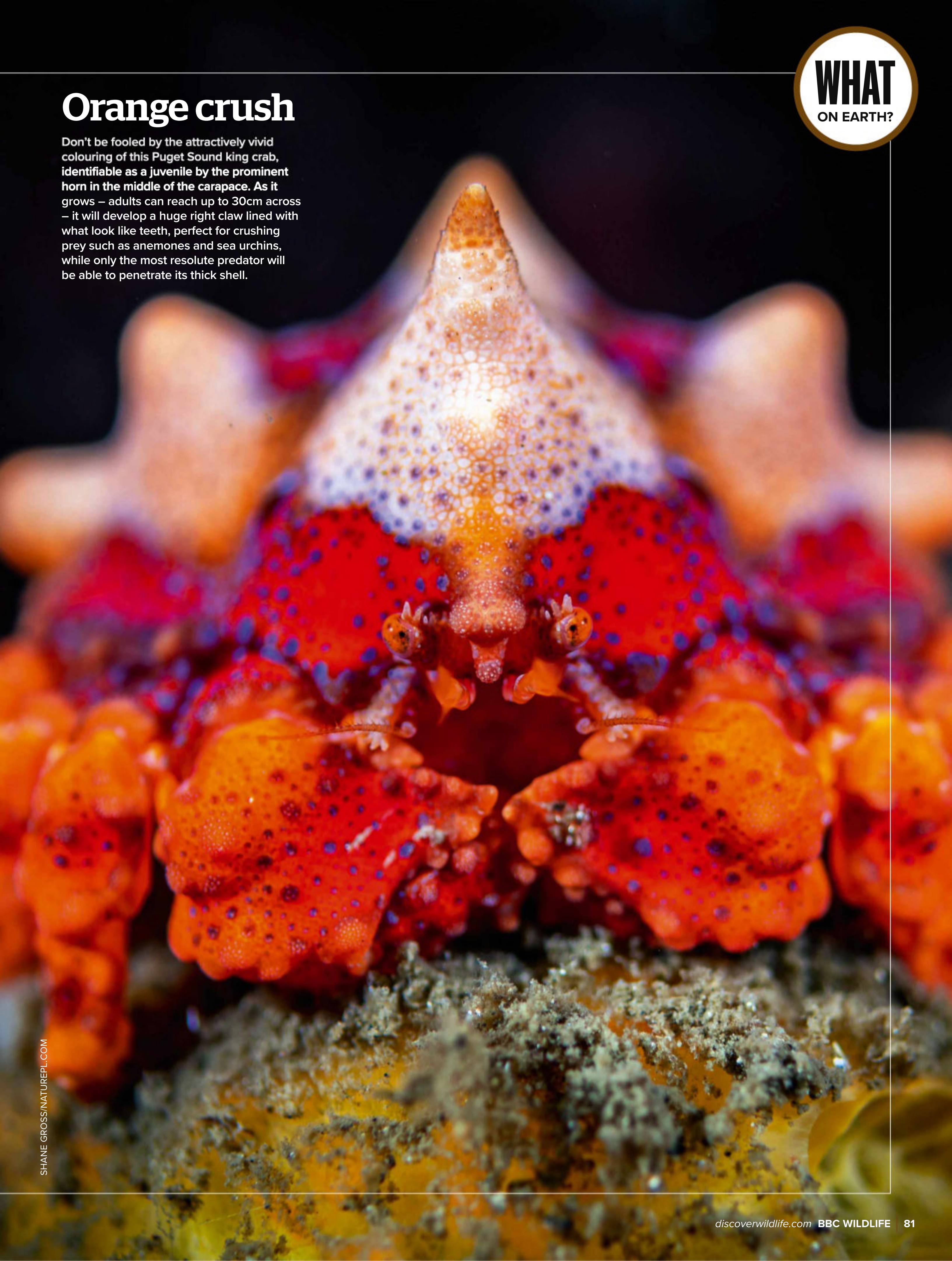
FACT.

Red wood ants have a venom gland that generates formic acid, which they use to fight against pathogens in their nests and as a weapon against other insects, such as wood-boring beetles.

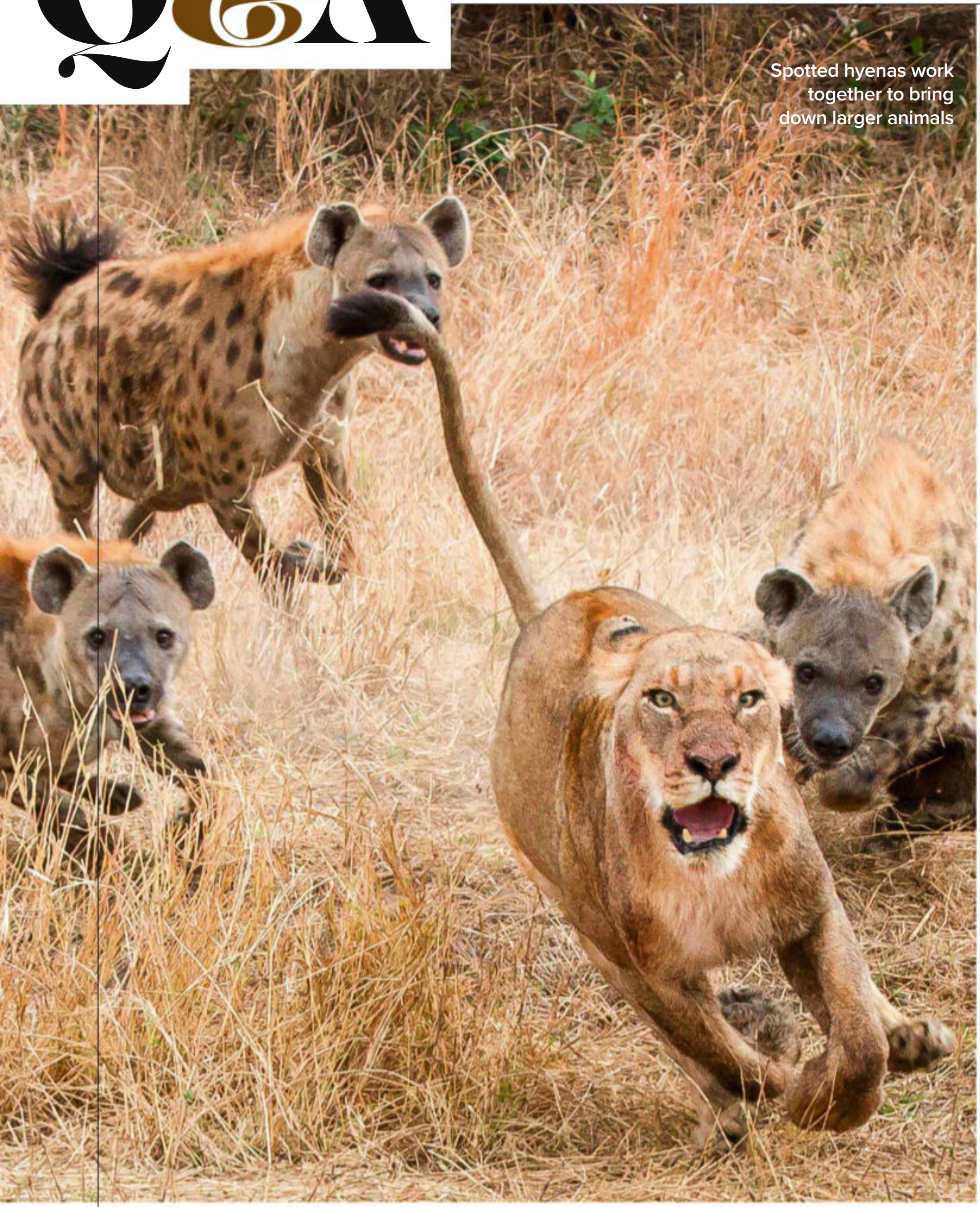
KITES AND BUSHFIRE: BRAD LEUE/ALAMY; WHISTLING KITE: BRET CHARMAN/NATUREPL.COM; SNAIL: BLICKWINKEL/ALAMY

Orange crush

Don't be fooled by the attractively vivid colouring of this Puget Sound king crab, **identifiable as a juvenile by the prominent horn in the middle of the carapace. As it** grows – adults can reach up to 30cm across – it will develop a huge right claw lined with what look like teeth, perfect for crushing prey such as anemones and sea urchins, while only the most resolute predator will be able to penetrate its thick shell.



SHANE GROSS/NATUREPL.COM



Spotted hyenas work together to bring down larger animals

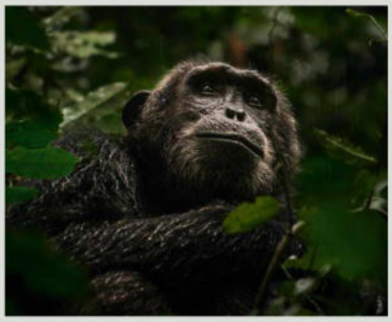
Do hyenas eat lions?

Hyenas' reputation as plucky, devious scavengers is not entirely unjustified. Of the four hyena species, two (striped and brown) certainly fit that description. But a third, the aardwolf, is a specialised predator of termites, and the most familiar (and the biggest) of the bunch is more of an active predator.

Spotted hyenas hunt smaller animals alone and work together to bring down zebras, buffaloes and giraffes, though they will also eat carrion and steal kills from other large predators. In the words of one mammalogist, "Their catholic tastes mean that virtually any animate and inanimate object is potential food."

Given the opportunity, that would presumably include lion meat – but whether hyenas could kill a lion is another matter. Competition for the same prey does bring the two species into conflict. At about three times the weight of hyenas, lions are usually dominant and are more likely to steal hyena kills than vice versa. But hyenas can turn the tables through weight of numbers. In a harrowing scene from the 2018 BBC series *Dynasties*, a young male lion is attacked by 20 or 30 spotted hyenas. He only escapes with his life when a second male comes to his rescue.

FAST ANSWERS



Chimpanzee in Uganda's Kibale forest

Do animals get Down's syndrome?

Human cells typically contain 23 pairs of chromosomes but people with Down's syndrome have three, rather than two, copies of chromosome 21, resulting in a suite of developmental problems. Chromosome duplication syndromes occur in other animals too, though each is specific to the genetics of the species involved. However, there may be a direct link between Down's and a syndrome in chimpanzees caused by an extra copy of chromosome 22. It has only been documented twice, but seems to involve eye and heart defects characteristic of Down's syndrome.

What is the most remote place on Earth?

This is usually understood to be the point on the Earth's surface that is furthest from land and, by that reckoning, it is a spot in the South Pacific that has come to be known as Point Nemo. It lies 2,688km from the Pitcairn Islands to the north, the Easter Islands to the north-east, and Maher Island in Antarctica to the south. This means that someone swimming alone at Point Nemo is likely to be closer to astronauts on the International Space Station (ISS) when it passes overhead than to anyone at ground level.

What is the strongest-smelling plant?

The titan arum, a species endemic to the rainforests of Sumatra, is widely lauded as the stinkiest of all plants. It is as well-known for its overwhelming odour as its huge flowers. Also known as the corpse flower, it is pollinated by flies and other scavenging insects, and lures them in by producing a sickening stench of rotting meat.

Titan arum flowers can exceed 3m

LIONS: LONDOLOZI IMAGES/MINT IMAGES/GETTY; CHIMPANZEE: JAMIE PHAM/ALAMY; PLANT: FADIL AZIZ/GETTY

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13	Funchal	Madeira	09:00	16:00	7h
14	At sea		-	-	
15	Horta	Azores	12:00	20:00	8h
16	Ponta Delgada	Azores	08:00	19:00	11h
17	At sea		-	-	
18	At sea		-	-	
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The Portuguese man o' war is, in fact, a superorganism

INSTANT EXPERT

Why social insects are superorganisms

WITH EVOLUTIONARY BIOLOGIST JV CHAMARY

Many ants, bees, termites and wasps form societies in which members belong to social groups (castes) with different roles, such as reproduction or foraging. The individual living things – organisms – in a colony often work together in such a coordinated way that they appear to be one entity, or 'superorganism'.

What is a superorganism?

It's a level of biological organisation above the organism. This concept was popularised by biologists Bert Hölldobler and EO Wilson in their 2009 book *The Superorganism*, but the two authors disagreed on an exact meaning of the word so there are several definitions. The clearest is in the book's glossary: "A society that possesses features of organisation analogous to the physiological properties of single organisms." Basically, a colony's individuals are like parts of a body.

How is a colony like a body?

The key feature is division of labour. In a body, 'germ' cells such as sperm and egg are responsible for reproduction while 'soma' – body cells – do the other jobs. Similarly, in social insects, the reproductive caste handles genetic inheritance while the other castes, including workers and soldiers, carry out tasks such as finding food, caring for a young brood or protecting the nest.

A colony also has systems for specific purposes, like defence against disease. Just as the body's immune system draws attention to parasites and can destroy an infected cell using molecules that punch holes in the cell's membrane, an insect colony kills sick individuals. For example, *Lasius neglectus* (a relative of black garden ants) uses 'destructive disinfection': after detecting chemicals released by a pupa infected with parasitic fungi, worker ants will bite open the cuticle to spray antiseptic poison. This sacrifice prevents spread through the colony.

Can colonies be organisms?

That's one way to look at it. Like body cells, individual insects collaborate as a cohesive unit. In fact, the superorganism concept was inspired by a 1911 essay by entomologist William Wheeler entitled 'The ant-colony as an organism'. A colony has collective intelligence, too, because it's structured like a brain: interactions among its members are akin to connections between neurones across a central nervous system, allowing features to arise that are more than the sum of its parts. These emergent properties, such as decision-making or the ability to map the outside world, aren't directed by any one insect (or brain cell).

Why do social insects evolve?

Natural selection – survival of the fittest – favours organisms that promote their own survival and reproduction, their evolutionary 'fitness'. But as Charles Darwin once said, "Selection may be applied to the family, as well as the individual." This works as an individual who cooperates with close relatives (kin) promotes its 'inclusive fitness' by helping their shared genes to be inherited. This theory is called kin selection.

Are societies stable?

Not all social insects live in perfect harmony! In many ponerine ants, workers are 'hopeful reproducers' with a capacity to mate, driving competition among the genetically identical clones. No mating equals more cooperation, less conflict.

Stability is more likely in 'eusocial' (truly social) colonies with division of labour, overlapping generations and non-reproductive animals who care for young. For example, leaf-cutter ants use a complex caste system, based on size and age, and hundreds of thousands of sterile workers collect leaves to cultivate fungus farms to feed the colony. This utopian society is what creates a superorganism.

Are there other superorganisms?

One candidate is the Portuguese man o' war. While it resembles a jellyfish, it's actually a colony of individuals called zooids, which form parts of specialised structures such as stinging tentacles or the floating, gas-filled pneumatophore.

Another example is *Dictyostelium*. These species of slime moulds normally live as single cells that hunt other amoebae but, during tough times, come together to build a multicellular body where a quarter of cells lose their reproductive ability and form a stalk to help spores disperse – a temporary superorganism.

NEXT MONTH

BREATHING

The many ways vertebrates breathe

PORTUGUESE MAN O' WAR: BIOSPHOTO/ALAMY; WOLF: MAURITIUS IMAGES GMBH/ALAMY

Q&A

Cane toads are notorious for their ecological impacts worldwide, following introductions by humans

ALL YOU EVER NEEDED TO KNOW ABOUT THE

Cane toad

BY JO PRICE

THE CANE TOAD IS A LARGE AND highly toxic amphibian. It's considered one of the world's most destructive invasive species after being introduced to countries across the globe as a biological control against insect 'pests' on sugar-cane crops, hence its common name. These introductions were largely unsuccessful, particularly in Australia.

What is the cane toad's natural habitat?

These terrestrial, nocturnal toads are native to South and Central America. They are adaptable and inhabit a variety of humid habitats, including grasslands, woodlands, wetlands and agricultural areas. They also live in urban areas, roadsides and gardens. The toads are attracted to places where there is standing water for egg-laying.

How does it produce toxin?

Cane toads have glands on their shoulders, known as parotoid glands. These release a milky-white toxin (known as bufotoxin) when a toad feels threatened. According to the Australian government, if cane toad toxin is ingested by other animals, it affects the heart, can cause excessive salivation, convulsions and paralysis, and result in death. The amphibians are toxic at all life stages – eggs, tadpoles, toadlets and adults.

Which animals *can* eat cane toads?

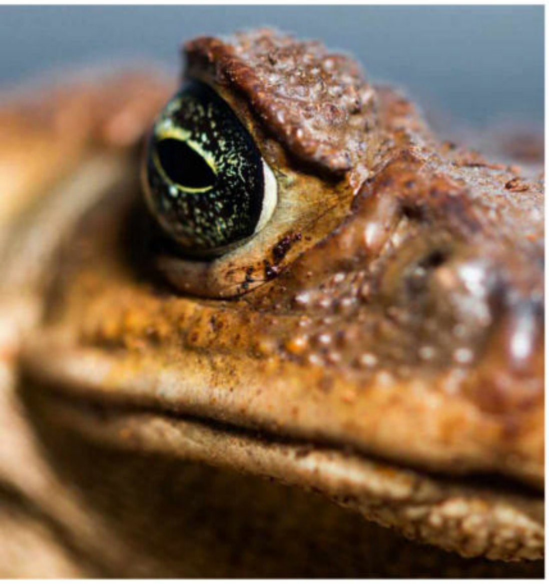
Predation on these amphibians remains limited, as many animals succumb to the toads' toxins. However, some species have adapted to prey on cane toads without being harmed, either by avoiding the poisonous parts or being naturally resistant to the toxins. The Australian Museum reports that the keelback snake can eat cane toads without lethal effects, and that red-bellied black snakes living in areas where cane toads are abundant have developed a higher resistance to the toxins, or avoid eating the toads altogether. Crows have learned to flip cane toads onto their backs to eat their non-poisonous bellies. Ibis wash cane toads before eating them and water rats remove parts of the toad that are safe to eat, such as the heart.

So, what happened in Australia?

In 1935, cane toads were introduced to Queensland to control two species of sugar-cane beetle, whose larvae eat the plant's roots. The results were disastrous. Cane toads are prolific breeders, and managed to rapidly expand their own population while failing to control that of the beetles. They caused significant ecological damage, outcompeting native species and consuming and poisoning the beetles' natural predators. Their presence is also thought to have increased the abundance of crop-eating rodents that can consume toads without ill-effect.

How many cane toads survive in Australia today?

There are reportedly more than 200



A cane toad makes short work of a frog

Top: The cane toad's eye structure is specialised for nocturnal hunting
Above: Long ribbons of black spawn

million cane toads in Australia. Since its introduction in 1935, the species has spread into most of Queensland, west through the Northern Territory into Western Australia, and south into New South Wales. Initiatives such as the Great Cane Toad Bust, which encourages participants to catch and humanely kill the amphibians, are attempting to curb numbers.

What's the largest cane toad recorded?

The Guinness World Record for largest toad dates back to March 1991, with a pet cane toad named Prinsen (The Prince) who weighed 2.65kg. However, another huge individual was found by rangers in Queensland's Conway National Park in January 2023. Nicknamed 'Toadzilla', it tipped the scales at 2.7kg, appearing to beat Prinsen's record. As is standard practice, Toadzilla was humanely euthanised.

What do cane toads eat?

Cane toads are opportunistic feeders with a varied diet. They primarily eat invertebrates, such as ants, termites, beetles, snails, spiders and grasshoppers, but also consume small reptiles, amphibians and even small mammals and birds if they can catch them. Cane toads are also scavengers, consuming carrion and food left out for pets. Instead of drinking, the toads absorb water through the skin on their bellies.

How many species are there?

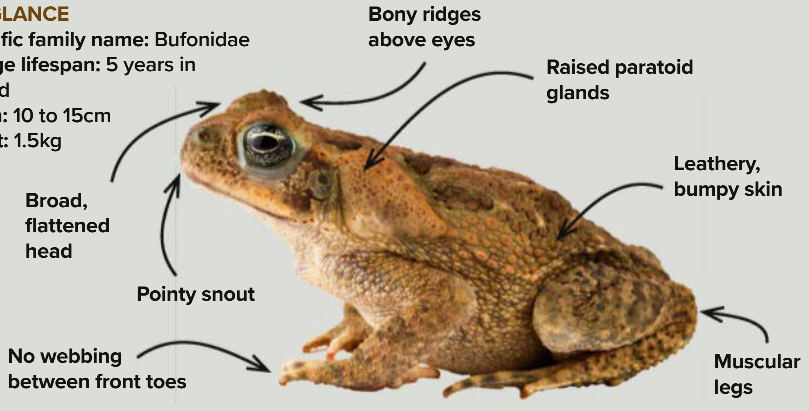
The United States Geological Survey (USGS) states: "Cane toads have long been considered to be one species throughout their range. However, studies have now differentiated these cane toads into two species: [the South American cane toad] *Rhinella marina,* found in South America east of the Andes, and [the Mesoamerican cane toad] *R. horribilis,* from South America west of the Andes through Central America to Texas." The former is the species that has been introduced widely worldwide. Both species are listed as Least Concern by the IUCN and have increasing populations.

How do cane toads breed?

Cane toads can breed all year round. Following amplexus (eggs are fertilised externally), spawn occur in long gelatinous rows of black eggs in the slow or still shallow waters of ponds, ditches, temporary pools, reservoirs, canals and streams. The clutch size can be between 8,000 and 17,000 eggs (clutch sizes of 35,000 are also known). Cane toads reach sexual maturity between 6 and 18 months and have a lifespan of about five years. ⓦ

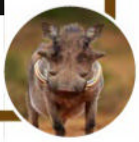
➔ A CANE TOAD'S SPECIAL FEATURES:

AT A GLANCE
Scientific family name: Bufonidae
Average lifespan: 5 years in the wild
Length: 10 to 15cm
Weight: 1.5kg

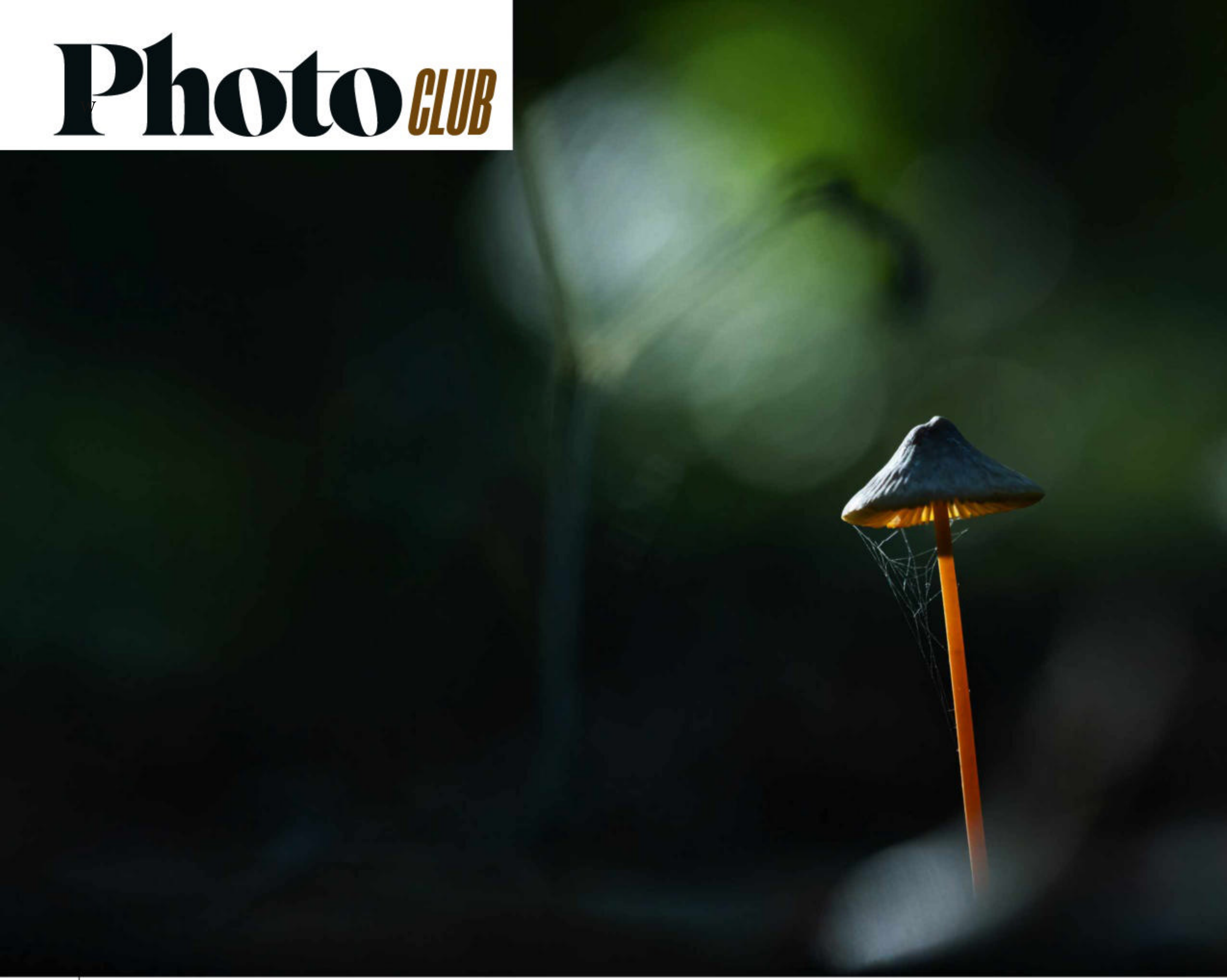


NEXT MONTH

WARTHOG
Meet the famous wild pig



CANE TOAD: ROLF NUSSBAUMER/NPL.COM; CANE TOAD EYE: ZDENĚK MALÝ/ALAMY; CANE TOAD SPAWN: MORLEY READ/ALAMY; CANE TOAD WITH PREY: AUSCAPE INTERNATIONAL PTY LTD/ALAMY; CANE TOAD CUTOUT: MINDEN PICTURES/ALAMY; WARTHOG: ROBERTHARDING/ALAMY

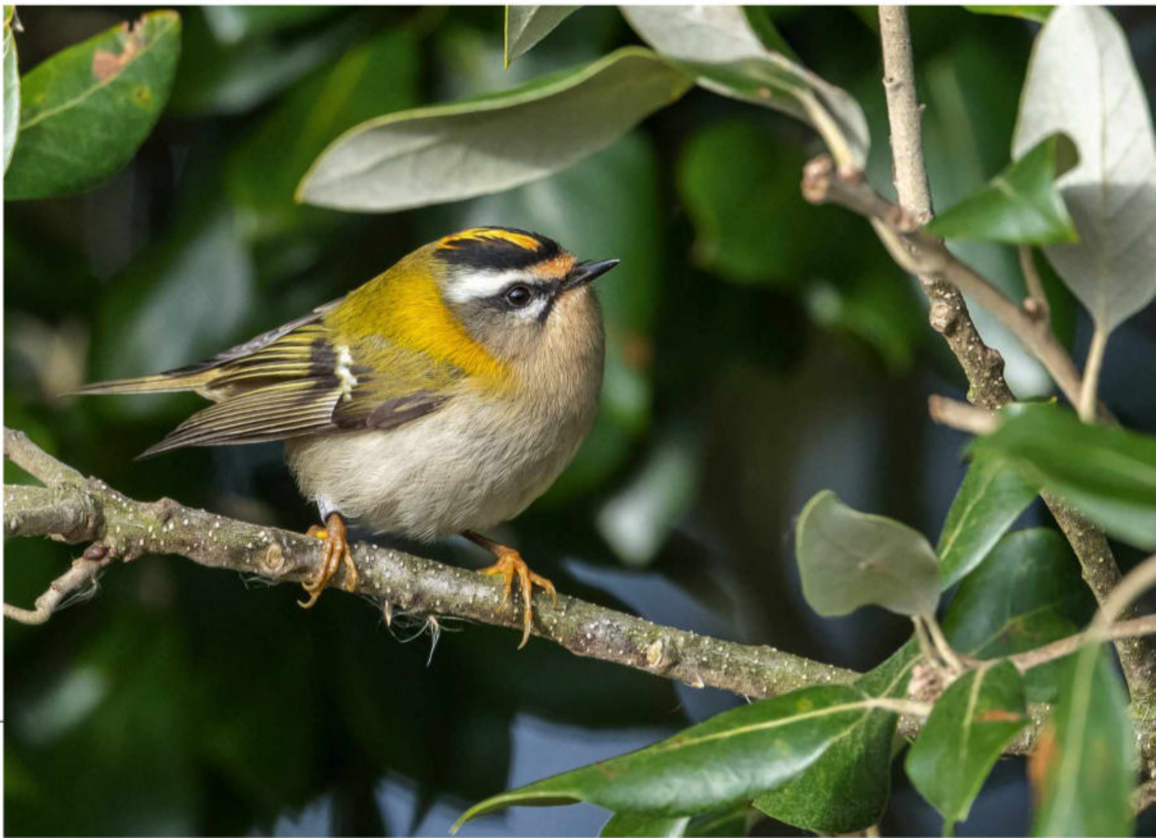


Magic mushroom

I crossed paths with this fantastic *Mycena galopus*, adorned with a tiny spider's web, during one of my favourite walks in the forest near my village in Normandy.
Catherine Régnier, Saint-Germain-d'Étables, France

Winter fire

I took this photo at Minsmere nature reserve in Suffolk, where two firecrests had been reported. After much looking, we found one of these fantastic little birds.
Ian Harris, Stevenage



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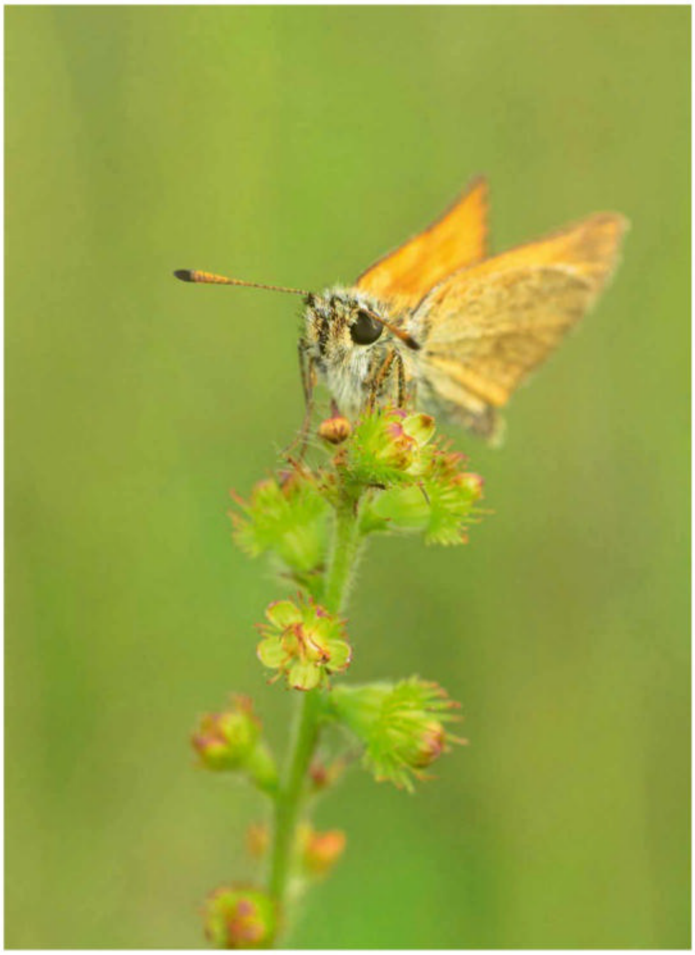
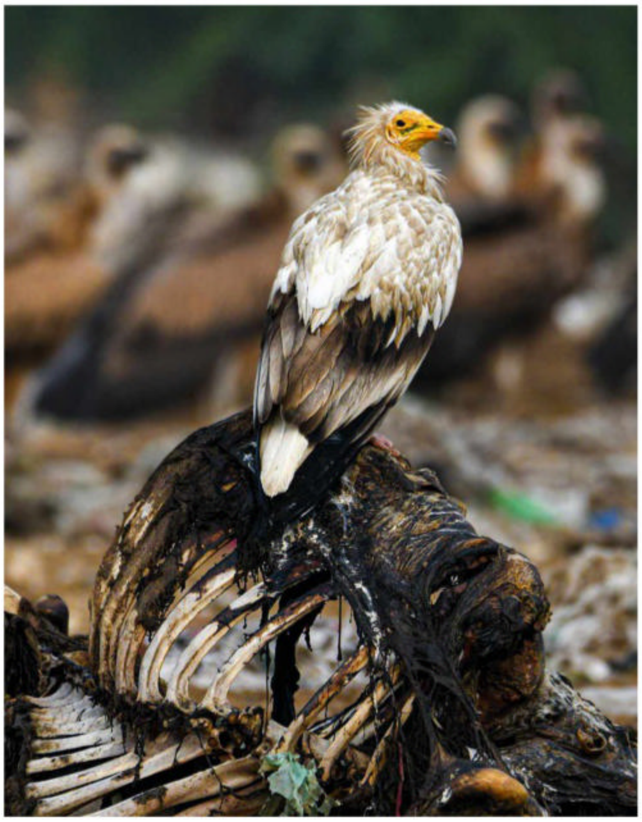
Hanging on

Insects engage in a delicate ritual of reproduction amid the lush foliage of a vibrant meadow.
Dakshesh Ashra, Mumbai, India

A place to rest

I found this thumbnail-sized Essex skipper butterfly roosting on an agrimony flower spike.
Mike Blacknell, Hampshire





Close to the bone

This Egyptian vulture sits on an animal skeleton in Jorbeer Conservation Reserve, a dumping ground for animal carcasses.
Prasenjit Dutta, Kolkata, India

Sue at 40m with cold-water corals

SNAP-CHAT

THE INSIDE WORLD OF WILDLIFE PHOTOGRAPHY

Sue Daly talks crustaceans, currents and cold-water coral

How did your career start?

My interest in marine life began in 1988, when I was learning to dive off the Channel Island of Jersey. I was fascinated by the creatures I saw and wanted to photograph them in more detail.

Which of your images is most significant to you?

A shot of a juvenile crawfish that I took in May 2014, off my home island of Sark. It was the first time I'd ever seen a juvenile of this rare crustacean, which was fished to commercial extinction in the Channel Islands in the 1960s and 70s. In 2014, the species started to make an unexplained recovery off the south and west of the British Isles, and I worked to get it protected off Sark by 2018. The image reminds me that overfished species can recover, but need our protection to flourish.

What has been your most memorable project?

Working in the waters around the Poor Knights Islands in New Zealand. The area has been a protected marine reserve for decades, and diving there is like swimming in a living fish soup. It's an amazing example of how rich marine life can be when we don't eat it all.

What's been your biggest challenge?

Photographing the cold-water coral *Lophelia pertusa* in Norway. It's bright white and looks as if it's made of porcelain. It normally lives in very deep water, but in Trondheim Fjord you can find it at 40m. Even at this depth you only have a few minutes of dive time and this, with the cold, made it quite a challenge.

Photobombed by a cuckoo wrasse

What's been your most memorable experience with wildlife?

Filming Atlantic grey seals in the Farne Islands has to be the most fun I've had underwater. It's like diving with a bunch of playful Labrador puppies. They are so fast and agile, and make even the most graceful human diver feel very clumsy underwater.

What's been your most hairy shoot?

I was once working on a BBC *Natural World* film about the Channel Islands. The director wanted to show the power of the tides, so the cameraman and I dived the narrow passage between Sark and the tiny island of Brecqhou while the tide was running at full tilt. The kelp was horizontal, the current was swirling in all directions and at one point my buddy's bubbles were circling around him then heading downwards. Not a sight any diver wants to see…

Any epic fails to share?

I once completely flooded my camera on my very first dive of a two-week trip to the Galápagos Islands. I had a back-up, but it wasn't nearly as good as the one I drowned.

Which species are on your bucket list?

Abroad, a weedy sea-dragon – an elaborate relative of the seahorse that lives off the southern coast of Australia. At home, an octopus. I've seen them elsewhere in the British Isles but not in the Channel Islands. They were once common here, but were wiped out by the very cold winter of 1962-3, when the edge of the sea froze. They have started to make a comeback in recent years.

What sort of discomfort do you regularly have to endure?

Being on a small boat in a drysuit is tricky when it comes to needing the loo. Men have a handy zip, but for women there's no option other than to peel the whole thing off, lower your backside over the gunwale and ask your companions to look away.

What item would you not be without?

Tea. And chocolate biscuits.

Any top tips for budding photographers?

Get to know your subject. What does it feed on, what time of day is it most active, how can you approach without disturbing it? Even if you don't shoot a single frame, you always learn something when you spend time watching wildlife.

Born in Shropshire but now based on Sark, Sue Daly is a wildlife film-maker and photographer: suedalyproductions.com

SUE DALY

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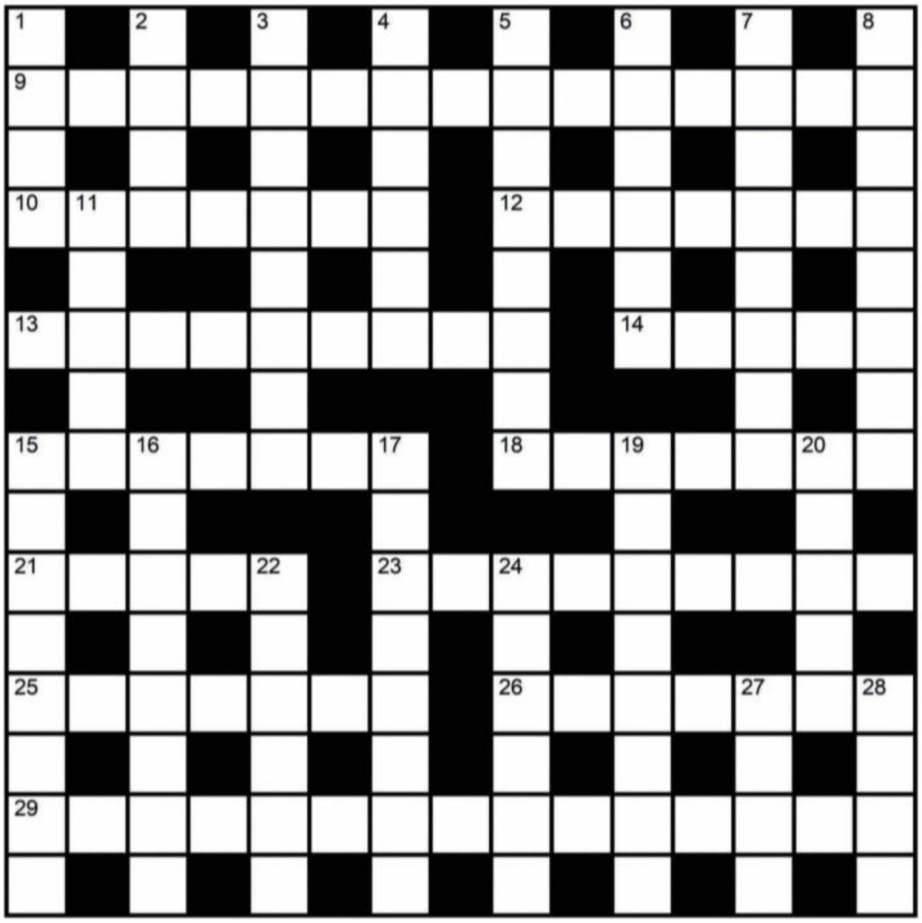
wild PUZZLES

The crossword



ACROSS
9 1984 David Attenborough series (3,6,6)
10 New World bird that may be boat-tailed or slender-billed (7)
12 2021 bird 'biography' by Stephen Moss (3,4)
13 Duck related to the bufflehead (9)
14 Tiny winged insect (5)
15 Water ___, insect also known as a pond skater (7)
18 Dandelion-like flowers in the genus *Leontodon* (7)
21 Dragonfly larva (5)
23 Alternative name for a gerbil (6,3)
25 Spiny monotreme (7)
26 Predatory fish of North America (7)
29 North Pacific seabird in the auk family (7,8)

DOWN
1 Male deer (4)
2 Flightless bird also called the Māori hen (4)
3 Foodplant of the swallowtail caterpillar (8)
4 ___ tuna, *Thunnus obesus*, large marine fish (6)
5 Beak protrusions that allow baby birds to break out of their shells (8)
6 Name given to a long-lived albatross known for its visits to Scotland (6)
7 Large crustacean of cold sea waters (4,4)
8 Alternative name for the musk turtle (8)
11 Gathering of sleeping birds (5)
15 Butterflies of south-east Asia (or hummingbirds of South America) (8)
16 ___ snail, aquatic gastropod (4,4)
17 Furry arboreal mammal of China (3,5)
19 Songbirds such as the blackcap or chiffchaff (8)
20 Fauna-rich country of southern Europe (5)
22 Practise kleptothermy, as emperor penguins do (6)
24 Another name for a woodlouse (3,3)
27 Long-bodied fish, typically marine (4)
28 ___ Lemon, British bird conservationist and RSPB co-founder (4)

January crossword

Across: 1 Ribbon, 4 Cruciate, 9 Nootka, 10 Mosquito, 12 Lancelet, 13 Welney, 15 Twig, 16 Locust tree, 19 Chiffchaff, 20 Ibis, 23 August, 25 Aloe vera, 27 Tragopan, 28 Yaffle, 29 Tree toad, 30 Banyan
Down: 1 Ringlet, 2 Brown kiwi, 3 Orkney, 5 Rook, 6 Coquette, 7 Avian, 8 Ecotype, 11 Lesotho, 14 Buffalo, 17 Robber fly, 18 Offshoot, 19 Coal tit, 21 Sea-bean, 22 Nevada, 24 Graze, 26 Java

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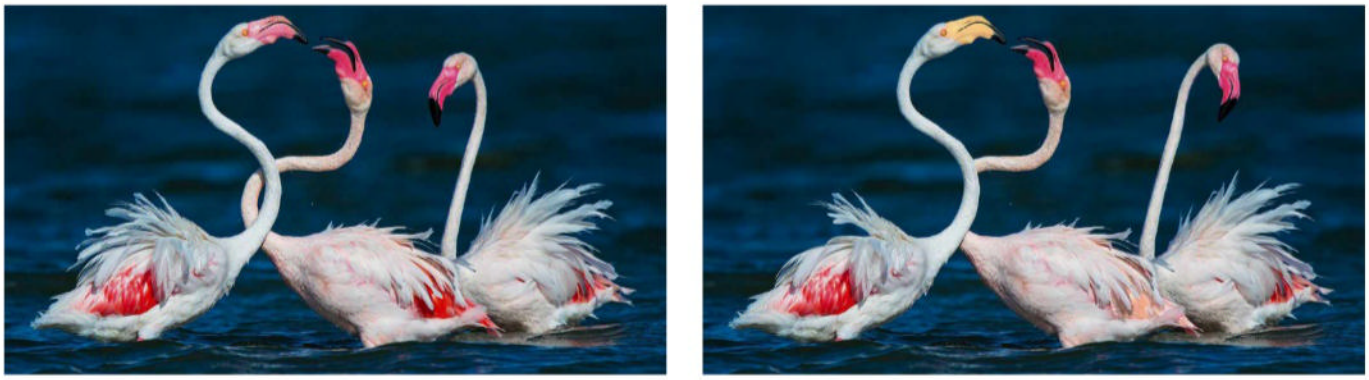
SPOT THE DIFFERENCE



MARTIN GRIMM/ALAMY

A group of greater flamingos (*Phoenicopterus roseus*) fighting during a courtship display. Flamingos are actually born grey and white and do not turn pink for two years. Can you spot all five differences between the two images? Turn to page 95 to find the answers.

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Your LETTERS

Could the European plaice be due a Sanrio-style makeover?

Cute characters can help to campaign for survival

THE ARTICLE IN THE JANUARY ISSUE about why cuteness matters in the survival of the fittest, and how to conserve less attractive animals, piqued my attention because that's what I always believed. To create a cute character based on a less attractive animal – say a flatfish – can help raise the public's awareness of conservation needs. To illustrate, one of the Sanrio characters, a fish called Hangyodon, could be used as a model for a cuteness project for a flatfish. I agree that we are biologically wired to fall in love with the pretty. So why not make less attractive animals adorable in order to campaign for their survival?
Stephanie Suh, Los Angeles, USA

Irish wolfhounds

In the Q&A article on the biggest wolf in the November issue, the author mentioned that wolves could achieve a weight of 80kg. He also mentioned several dogs weighing more than that weight. What I find to be a critical omission is the failure to mention the breed specifically bred to run down and kill wolves (at one time), the Irish wolfhound. The Irish wolfhound is also, as a breed, taller and faster than the great dane.
Brian Foresman, via email

Global reach

I am writing from Chile to tell you that I have enjoyed the magazine so much over the last year. Chilean digital public library BPDigital included *BBC Wildlife* in its catalogue, and we have been able to download the issue each month.
I am grateful because I've learned a lot of things about nature around the world and understood the urgency to care about our planet. My favorite sections are Female of the Species by Lucy Cooke and Gillian Burke's column.
Marianela Venegas Rojas, Chile

Collective nouns

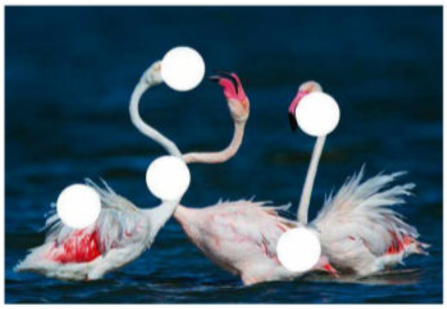
The January issue of *BBC Wildlife* was as thought-provoking as ever, and made me ponder the lack of a collective noun for snakes. I offer these: coil or slither. My preference is for the latter, though both are transparent enough. Alternative collective nouns for some other species have also occurred to me, though these are already catered for: a diet of worms. A hall (or haul) of toads. Best to stop there, I think!
Anthony Watson, via email

Fox hunting

Mark Carwardine's article on fox hunting in the February issue was excellent, saying precisely what needs to be said about this sadistic bloodsport. Introducing terminology such as 'wildlife crime', 'illegal' and 'organised crime gangs' highlights the reality of what is behind this killing for fun. Foxhunting is bloodthirsty and cruel, and whatever hunt supporters argue in their defence, their actions and attitudes are bloodthirsty and cruel too. It is a criminal matter and should be dealt with accordingly. Archaic arguments that it's tradition no longer hold any sway. People can see through the lies and smokescreens. The Labour party made a manifesto commitment to strengthen the laws around trail hunting etc but they must do this now, with robust legislation and resources to stop the abhorrent and inhumane slaughter of these beautiful and sentient creatures.
Jacqueline Bain, via email

Respectful distance

The piece by James Fair in the January issue on the impacts of social media and photography on wildlife has moved me very deeply. I would love to see more awareness about this. I have recently started taking photos and have loved appreciating the wildlife around where I live. I was taking a photo of a grey heron the other day and I remembered something Chris Packham said about maintaining a respectful distance, which I tried to do. I hope to see more articles on this so we can remember one's place and respect the wildlife around us.
Andrea Cope, via email



Answers to Spot the Difference on page 93

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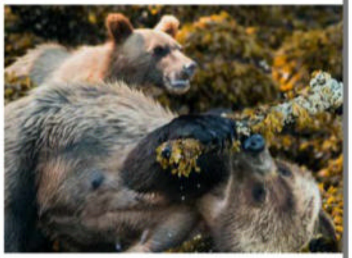

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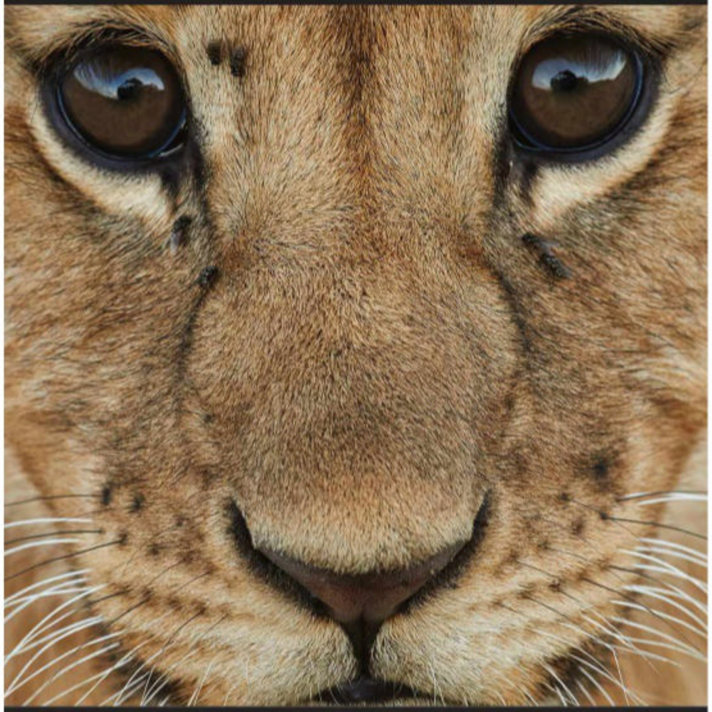

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NEXT MONTH

Coming to America

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ON SALE
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NICK GARBUTT/NATUREPL.COM

Top TEN

The flamboyant feathers of the rainbow lorikeet

Malabar giant squirrel

Red-eyed tree frog

Rosemary beetle

Rainbow animals

Meet the multicolour marvels of the natural world

1. Rainbow lorikeet

Parrots are renowned for their striking colouration. One of the most eye-catching is the rainbow lorikeet, found in Australia. It nests in hollow trees and feeds in the upper canopy, and is known to roost in flocks numbering in the thousands.

2. Angelfish

Bright, tropical marine angelfish are a sight to behold and there are dozens of species, all with distinct colouring. You'll find them swimming around coral reefs in the Atlantic, Pacific and Indian oceans. They like the warm, shallow waters, and their flat, rounded bodies enable them to easily manoeuvre around the coral.

3. Malabar giant squirrel

Squirrels don't come much bigger than the Malabar giant, also known as the Indian giant or rainbow squirrel. Found only in India and considerably bigger than the UK's native red squirrel, it's not actually the Malabar's size that turns heads, rather the striking hues of its fur. Its back and flanks are adorned with bands of deep reds and blues.

4. Peacock spider

Despite being the size of a grain of rice, a male peacock spider must put on a spectacular courtship display to attract a mate – and to stay alive. He waves his back legs while displaying a brilliantly coloured fan attached to his abdomen. If the female approves, he is allowed to mate. If not, she injects a lethal dose of venom into his brain, rendering him nothing more than a meal. There are more than 80 different species of peacock spider in Australia and China.

5. Madagascan sunset moth

The day-flying Madagascan sunset moth has a striking appearance – black with iridescent red, blue and green markings. Unlike other moths, the colour of the wings does not come from pigments but occurs from light hitting the microstructure of the ribbon-like scales covering the wings.

6. Panther chameleon

Contrary to popular belief, panther chameleons don't just change colour for camouflage. The primary role of the behaviour is actually to do with social signalling and communication. The top layer of a chameleon's skin contains special cells with pigments and tiny crystals, which are different shapes and sizes. The chameleon can move them around by relaxing or exciting the skin, which reflects light in different ways, enabling it to change colour.

7. Red-eyed tree frog

Here's a multi-hued amphibian that knows how to dress for the occasion. The body of the red-eyed tree frog is bright green, with stripes of blue and yellow down the sides and bright orange feet. When disturbed by a predator, it opens its red, bulging eyes, startling the intruder long enough for it to escape to a safe space.

8. Peacock mantis shrimp

Of the hundreds of different types of mantis shrimps, the peacock is probably the most spectacular. The crustacean's hard-shelled body is usually blue, green and yellow, and it has red legs and purple eyes that sit on top of stalks above its head. The eyes can move independently of one other for a better view and, with up to 16 types of colour-sensitive cone cells in their retinas (humans have three), their colour vision capabilities are unparalleled.

9. Rosemary beetle

The rosemary beetle is named after its habit of dining on the foliage and flowers of aromatic plants, such as rosemary, lavender and thyme. It's a small, shiny beetle with metallic green and purple-red stripes running along its carapace. It may look attractive but its habit of feeding on new shoot tips makes it unpopular with gardeners.

10. Gouldian finch

Finches are known for their colourful plumage and the Gouldian finch may be the brightest of them all. Found in Australia, its face is usually black, while about 25 per cent have red faces, and a rare few have yellow.

Charlie Lyon

NEXT MONTH

CLEVER ANIMALS...

... that don't have a brain

RAINBOW LORIKEET: ARTERRA/GETTY; MALABAR SQUIRREL: SYLVAIN CORDIER/GETTY; FROG: ADRIAN DAVIES/ALAMY; BEETLE: IMLADRIS/ALAMY; BOX JELLYFISH: ULLSTEIN BILD/GETTY

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